

JPRS-UNE-86-003

14 NOVEMBER 1986

# USSR Report

NATIONAL ECONOMY

EKO: ECONOMICS AND ORGANIZATION

OF INDUSTRIAL PRODUCTION

No 7, JULY 1986

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Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA published in Novosibirsk.

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PUBLICATION DATA

English title : EKO: ECONOMICS AND ORGANIZATION  
OF INDUSTRIAL PRODUCTION No 7,  
Jul 1986

Russian title : EKO: EKONOMIKA I ORGANIZATSIIA  
PROMYSHLENNOGO PROIZVODSTVA

Author(s) :

Editor(s) : A. G. Aganbegyan

Publishing House : Izdatelstvo "Nauka" |

Place of Publication : Novosibirsk

Date of Publication : Jul 1986

Signed to press : 27 May 1986

Copies : 153,503

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i organizatsiya promyshlennogo  
proizvodstva", 1986

## ACCELERATION OF SCIENTIFIC AND TECHNICAL PROGRESS DISCUSSED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 3-20

[Article by V. S. Sominskiy, doctor of economic sciences, Leningrad Technological Institute of the Pulp and Paper Industry: "Scientific and Technical Progress: 'Look to the Roots...'" ]

[Text] The 27th Party Congress set for us a task of principal importance: to bring the national economy up to the leading ranks of science, technical equipment and technology. This is not a simple task. It is possible to equip a plant with the best technical equipment and manufacture products according to an ideal waste-free and highly productive technology, and the consumer will not buy them. For the products do not satisfy his needs. Either they are not fashionable or they are inconvenient or they do not have a good appearance or they are generally ineffective to use. Thus the main goal of scientific and technical progress is the final product, and not "in general," but acquired by free will. This correction "free will" is very important, and the measure of its influence will be increasing continuously. Today it is being felt in the sale of goods for private consumption. But even in this sphere "free will" is not in full effect. Far from all kinds of goods and services are available in abundance and conditions have not been created everywhere for selection and preference. And in the sphere of industrial consumption this correction does not exist at all. Here the consumer, as a rule, acquires "what they give him" and "what they allot" according to the funds for equipment and materials, and certainly not what he would want. As a result there is a distorted idea of the real amount of the produced final product or the actual effectiveness of scientific and technical progress.

How can this problem be solved? In the first place, it is necessary to change over to wholesale trade in means of production. This is not a new task, but apparently neither the Gosnab nor the Gosplan nor the financial agencies want to deal with it, even though the effectiveness of scientific and technical progress decreases sharply because of this. As long as there is no wholesale trade it is necessary at least to take into account the actual (and not the planned-calculated) satisfaction of demands for material and technical means for manufacturing the final product. To do this it is probably necessary to have systematic investigations and selective questionnaires. They are necessary, of course, in the sphere of private consumption as well.

Second, it is necessary to essentially improve the current methods for determining the effectiveness of capital investments and new technical equipment and take into account the effect for products for private consumption--in terms of the difference between the value of products that are actually sold at retail prices and their production cost for the manufacturer. As we change over to wholesale trade in means of production the effect here too will have to be determined as the difference between the actually sold products at established wholesale prices and the production cost.

In the third place, it is extremely important to have an objective account of the proportion of the final product in the gross national product. Today the account is organized on the basis of planned volumes of production and not sales, and these are production and sales under the conditions of an artificially created deficit.

#### Normatives--Reference Points of Progress

Another path to accelerating scientific and technical progress is to create normatives.<sup>1</sup> In spite of a number of directives and decrees, little has changed in this area. Attempts to solve the problem during operation for a year or even several months through the forces of random people and organizations who have not dealt with this previously have produced only formal results in the majority of branches. Yet the Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000 takes note of the need to provide for the introduction of a system of progressive economic normatives into planning and to utilize normative methods extensively at all levels of management and planning. It is necessary to have a system of normatives, beginning with purely technical ones (expenditure norms, technical parameters and specifications) and labor normatives, and ending with normatives of results, consolidated ones: expenditures, effectiveness, the scientific and technical level and the satisfaction of needs. Moreover the normatives should be such that it would be very difficult to achieve them and impossible to overfulfill them without outstanding scientific and technical achievements or unusual personal qualities found only in individual people ("Tsar of the Lathe," "Iron Fitter," "Super Welder," and so forth). It seems to us that the work for formulating, establishing and revising (when the base is changed) normatives should be continuous and should be regarded as the most important work in planning and evaluating the results of economic activity as a whole and scientific and technical progress in particular.

In connection with normatives that function as an assignment we shall touch on the problem of standards. There are more and more of them. Is there an objective need for this? In our opinion standardization and its normative documents (GOST's, OST's and so forth) should strictly monitor the quality of materials (parts, components, instruments and equipment) which are for general use. But why does one need a standard for a dress, a shoe, or special-purpose equipment? If I like a suit and it fits me I buy it, if I do not like it no OST will help to sell it. If specialized equipment makes it possible to do what the consumer wants, all that is necessary is an agreement with the

manufacturer. And reliability will be provided by the manufacturer of parts, components, painting and so forth.

Standards for everything--from a symbol to a gigantic turbine-generator--are a tribute to the dictate of the manufacturer and not at all to the interests of the consumers. Standardization agencies headed by the "SSR Gosstandart" are called upon to occupy an important position in providing for acceleration of scientific and technical progress. But they occupy this position only when they refrain from the desire to embrace the unbridled and unscientific standardization of raw materials and products for profit and purpose.

### The Main Direction of Machine Building

Strengthening standardization for raw materials, processed materials (except for specialized ones), parts and components will make it possible to bring right up to the problem of the prefabrication of structures. The modern theory of machines and mechanisms and its practical application make it possible in principle to eliminate mechanics' shops with diverse work in the equipment. The appearance of these shops in machine-building plants and the system of repair work is explained only by the reason of the small assortment and quantity of parts, components, instruments, etc., and the modules (sections) which make it possible not to manufacture but to assemble any element of a machine, instrument or set of items for private consumption.

As we know (articles about this have appeared in EM more than once) the modern machine tool fleet is dispersed in three kinds of "Machine Banks": in machine building itself, machine building of non-machine-building branches and in repair work, then certainly not the largest part of the machine tools are to be found in the first category. While developing in all ways the development of machine building itself as the basis of scientific and technical progress it would be expedient to transfer to it some of the machine tools and capital from other branches (including from repair branches) and at the same time to relieve it of the production of specialized machines necessary for only one branch or sometimes only one or two enterprises in the country, a function which is not natural to it. Such machines, devices and instruments could be assembled by their consumers, relying on prepared parts, components, sections and modules. The repair system should be arranged analogously.

The degree of prefabrication of elements signifies not an ordinary increase in labor productivity, but a giant leap. Not 40-50 percent, but 1-5 to 1-fold. And in order to follow this direction of scientific and technical progress we need not so much additional capital as organization and planning decisions.

### The Position of the Scientist and the Engineer

In order to accelerate scientific and technical progress it is important to think about the role and position of scientific and engineering labor in public production and expanded reproduction of a socialist society. With respect to science everything appears to be clear: this is the most important

productive force, which penetrates all elements of productive forces; science is the basis of scientific and technical progress. (15) And where does one include science: in the production or nonproduction sphere? Should expenditures on science be taken from the fund for accumulation or the fund for consumption? These are not at all abstract questions. Until they are resolved, scientific production associations will "sit on two chairs." And this is why there are only a couple of hundred of them in industry. Until these questions are resolved we will not be able to arrange for efficient ties between scientific research institutes and production associations for the development and application of new technical equipment.

Today expenditures on science are financed from the same source as social-cultural measures (education, public health, social security). All attempts to form an effectively functioning system of "science-production" have come up against this obstacle. Yet the works of a number of Soviet economists have proven and shown that one cannot regard all of science as a separate sphere of public labor. What today is called branch science, which receives a large part of the funds allotted for science, should be included in the production sphere. Workers in branch science (and also in the corresponding VUZ branch laboratories) are participants in the production process. And the nonproduction sphere includes that part of science which is engaged in fundamental research in all branches of knowledge, as well as its contribution to education (training) and public health, which is also in a mediated way--to branch science.

In domestic practice there are individual, highly scattered examples of combining science and production into a unified complex. Such complexes have been in operation for quite a few years now and the Soviet Metalworking Association. But on the whole the principles of planning and financing of science remain the same as they were at the beginning of the 1930's, at the dawn of industrialization. It seems that this is the result, especially by the low level of utilization of the scientific potential of the higher school for accelerating scientific and technical progress. According to current "theoretical" ideas of planning and financing science in the corresponding practice, VUZ science comes under the item of "Education" in the overall heading of social and cultural measures, and it is separated by a solid barrier not only from production, but also from the item "Science and Scientific Service." Yet approximately one-third of it is involved with theoretical and fundamental research, and two-thirds with applied (branch) research. Differentiation in the planning and financing of science, taking into account its position in public production, is an important demand of the times and one of the levers in the acceleration of scientific and technical progress.

By including branch science in the production sphere, we remove unjustified barriers between applied science and engineering labor. The engineer in production is primarily a researcher. The goals and tasks of his labor are to reveal and put to work reserves for improving the organization of labor and production, technology, and qualitative characteristics of the products, and raising the scientific and technical level and increasing the effectiveness of the production process. There is no principal difference between the content of the labor of the scientific associate of a branch scientific research

institute (or scientific research institute that is a part of an association) and a shop engineer, an associate of a technical division of plant management and a designer. The only difference is in their job duties. This means that the principles for payment and moral incentive should be the same for all of them.

Of course what has been said is true only when the engineer is relieved of management functions that are not properly his. For a number of reasons (both historically conditioned and subjective, related to the neglect of scientific organization of labor and management) engineers have been made responsible for various management functions. They are employed as foremen (who are far from being able to show the worker how to work) and chiefs of shifts, sections, work rooms, shops and productions. They are employed as head engineers. And, of course, as engineer-directors, engineer-administration chiefs, engineer-ministers and managers of state committees and departments.

All these specialists in the area of technical equipment and technology make an extremely modest contribution to scientific and technical progress. According to our estimates, the engineering labor of engineers who are forced to work in management amounts to no more than 15-20 percent. And what a powerful acceleration scientific and technical progress would achieve by including in its movement the gigantic potential of the corps of engineers which has been created after many years of effort on the part of the party and the Soviet state!

There is no doubt that management of the collectives and their economic and social development is a no less important matter. But specialists of a particular profile are needed here. We can arbitrarily call them organizers. They need to know the theory of management at the level of the brigade, section, shop, plant, association, branch and national economy. They should also have knowledge of sociology, psychology, the fundamentals of economic and labor law, scientific organization of labor, economics and organization of production with fundamentals of planning, statistics, marketing and so forth. And in addition to all this it is necessary to have personal capabilities and inclinations for such activity, to have party principles and a high level of responsibility, and be distinguished by what is called the ability to make contact. Up to this point the majority of managers have used the trial and error method to become what they are. But they should be taught, and taught not in short-term courses and departments, but over a period of 2-3 years. Life shows that good organizer can be acquired from the ranks of engineers, scientific workers, and brigade leaders, that is, people with the basic experience and knowledge. But let the engineers do their own work--scientific and technical progress.

#### Concerning the Payment and Prestige of the Labor of Engineers, Scientists and Organizers

In our opinion there is no need to prove the point that the payment for scientific, engineering and organizational labor should be higher than for physical labor. This has been the case in all times and the more so in the age of the scientific and technical revolution. There is no doubt that the

directive of the State Society that he should be entitled to a higher wage. He said that in a situation where the average earnings of the collective are higher than those of the engineer or technician, this will certainly not be any pleasure." Let us add to that that the more progressive the organization, labor and the labor of a worker also have a close relationship in the question of physical labor. An eminent worker, a winner of honor awards and medals who has completed a correspondence higher educational institution, playfully speaking, falls from the level of moral products. He was a manual worker and has become a rank-and-file engineer. What reason has he to think about accelerating scientific and technical progress?

A positive interpretation of Marxist-Leninist ideas concerning the collective (total) worker will help to change this situation, which has been aggravated severely during the past 15-20 years. But in a modern factory, in the production system there is no participation that is less or less important. Everyone is necessary and important: the worker, the engineer, the technician, the manager, and the scientific associate. It is necessary in the socialist social formation under the conditions of public property that the concept advanced by K. Marx of the collective worker acquire outstanding significance. The antagonism inherent in capitalism does not and cannot exist among its constituent parts. And the labor of the worker should be evaluated under socialist conditions on the basis of account not for personal qualities and personal contribution without any restrictions or exceptions except those that are generally known: the limit of the overall wage fund and the more rapid growth of labor productivity. The decree of the Gos-Comtsev Committee, the USSR Council of Ministers and the ANTSU which came out on 27 May 1955, "On Improving Wages for Scientific Associates, Technicians and Technologists in Industry," was directed toward increasing the material and moral incentives for workers of these categories to solve scientific and technical problems and create and introduce new technical equipment and technology. A task was set to provide for a closer link between the payment for their labor and their personal contribution to the acceleration of scientific and technical progress.

The decree also emphasizes maintaining the right of workers to stimulating scientific and technical progress. And these of doctors to health and the effectiveness of numerous therapies. Therefore of those that all people are entitled in their calculation, medical care and establishments, and many thousands more are created in straightforward construction. The limit for wages, in our opinion, should be salaries and wage rates, and they should be necessarily increased (or decreased) on the basis of additional work and under the supervision of the labor collective. And salaries should be not only as a form of incentives of a one-time nature and should be against the capitalist job, taking maximum advantage of the competitive job and paying them in appreciable amounts. And, of course, we cannot limit the payment to certain expenses, distribution charts and other reasonable expenses. And here again Comrade I. Viskin is undoubtedly right: "The position for us directors is also in the fact that we are free to fire 10 engineers who do not work and within the limits of the established salaries pay each 100-120 rubles a month. But we do not have the right to replace them in with one and only three and pay him according to the results of his personal labor which has found concrete reflection in the economic activity of the enterprise. It is extremely impor-

sighted from the economic and also from the social standpoint to draw the evaluation of mental labor into the framework of average monthly wage ratios."

### The Significance of Planning

In the USSR more than 1 million people are engaged in the planning of enterprises, buildings, structures and other facilities, and almost 70 percent of them are engineers and technicians.<sup>3</sup> The role of planning in increasing the effectiveness of public production and realizing the achievements of science and technology can hardly be overestimated. It is precisely in the plans that one invests the most progressive solutions and, alas, allows mistakes which lead to arrears. Yet up until recently planning has occupied a clearly secondary position in capital construction--both new construction and reconstruction and technical renovation. Expenditures on planning have remained at practically the same level for many years, comprising only 2 percent of the overall volume of capital construction. This is several times less than in industrially developed countries (8-10 percent). Economizing on planning ends up in inefficient ratios between the active and passive parts of fixed production capital. In 1984 the proportion of equipment in capital investments amounted to 37 percent, and in construction and installation work (and, correspondingly, buildings, structures and so forth)--12 percent. Yet effective production which relies on the achievements of scientific and technical progress is possible only with a reverse ratio.

There are the most diverse explanations of this; many decisions have been made to raise the level of planning. But one can hardly count on success from decrees if they do not take into account the circumstances that ensue from the position of planning in the reproduction cycle. It is precisely planning that substantiates and calculates solutions that provide for effective expanded reproduction on the basis of reconstruction and technical renovation. Planning is not an appendage to construction; it is a program introduced into the mechanism of capital construction and is the brain of the construction organism. In order to develop a program it is necessary to combine scientific and technical achievements with the actual conditions of reconstructed production, the capabilities of construction and the deliveries of equipment. This can be done only by highly qualified engineers, whose level and payment should be commensurate and compatible with the level and payment of the leading managers of industry, eminent scientists and talented workers. This pertains also to specialists of planning institutes and to those who are engaged in planning within the framework of associations and enterprises.

But even the most talented planner has at his disposal only that which he has gleaned from catalogues, prospectuses, reference works and expert information. But this is in the present day, while the plan must include what will be available the day after tomorrow. In our opinion, there is only one solution here: to rely on experimental production.

## Experimental Production--The Foundation of Progressive Technology

It would be good to understand and firmly grasp the idea that moving from the laboratory or design bureau directly to production is the grossest violation of technological discipline. I recall that an extremely respected director of a large enterprise, in response to a suggestion to equip an experimental shop, said: "Well, we shall bring something in, try to test something. If the development works we will immediately take it to the boiler" (and this "boiler," let us note, is not a kitchen boiler, but a container that will hold 320 cubic meters and is the height of a 15-story building). This director's colleagues, sitting in the branch ministry and the Ministry of Foreign Trade, always cross out experimental installations when purchasing sets of imported equipment. For purposes of saving, of course.

Yet the experimental model, the experimental technology, the experimental equipment and the experimental batch--these are the basis for planning which is intended for industrial embodiment of experimental data from 5-7-10 years later.

But experimental production is not only the base of planning. Its results were used for arranging industrial production under the most advantageous conditions. Without experimental verification and testing one cannot teach the workers of the enterprise that is assimilating the new production or prevent accidents and deviations from the specified conditions, and as a result--sharply reduce the time period for assimilation. It has been calculated that delay in assimilation is hundreds and thousands of time more costly than expenditures on experimental installation and its operation.

Experimental production is intended not only for reproduction of the results of scientific developments under conditions that are as close as possible to the future industrial manufacture. At existing enterprises its purpose is to serve as a center for verifying the proposals for improving technology, a center for testing the changes necessary in technology because of fluctuations in the composition of raw and processed materials, because of changes in the design and the working conditions for the equipment, and so forth. It is a shame and a pity to read in branch scientific and technical journals discussions of how "skillfully and flexibly the equipment operator N controls the technological process with an immense aggregate." What kind of technological discipline is this and where is the scientific and technical progress if the technological process can be changed by the worker at his own discretion! Only after experimental verification is it permissible to make changes in the existing technological process, and then it should be the law: no deviations from the established conditions.

As engineers engage more and more in engineering labor, the basic place for their work will be experimental production, which is necessary, in our opinion, at all enterprises: new and old, large and small, complicated and simple.

## Concerning Control of Scientific and Technical Progress

The acceleration of scientific and technical progress depends to an appreciable degree on the branch ministry and the state agencies that directly influence the directions of scientific and technical progress, its planning, financing and realization of the results. But with their current composition, when establishing rules and procedures for forming staffs, these organizations are incapable of performing many functions in controlling scientific and technical progress. They delegate these "function-duties" to scientific and planning institutes under their jurisdiction. The author recently had occasion to participate in a coordination conference concerning a branch plan for scientific research work. Approximately 40-50 percent of this work in the area of economics and management and 15-20 percent in the area of technical equipment and technology is actually instructions from ministries and central planning agencies which they should carry out themselves.

For more than a decade, under the strong leadership of the USSR Ministry of Finance, there has been a battle to reduce the number of management personnel. But never have they set the task of optimizing these personnel, bringing them in line with the requirements and duties that ensue from changing over to an intensive economy on the basis of scientific and technical progress. There is no doubt that it is impossible to approach the question of relations between management personnel and production personnel in a socialist society with measures and evaluations that are borrowed from capitalist social relations and early stages of socialist construction. At one of the conferences the director of the ZIL Association at that time, the well-known manager Comrade P. D. Borodin correctly noted: "The management staff can increase and it increases here at ZIL as long as this contributes to increasing labor productivity and the income of the association's collective at more rapid rates and on a large scale." The same thing is true for other units and levels of management.

This means that it is not a matter of whether there are too many or too few workers employed in management but of what they are engaged in and how, and what the advantage of this is. In this connection it makes sense to transfer to the staffs of ministries and departments those workers who are currently employed in scientific research institutes and design bureaus with instructions from these same ministries and departments. Each would begin to do his own work.

Another thing that is certainly not secondary is the question of providing personnel for the staffs of ministries, central departments, scientific research and planning-design organizations and VUZes that are located in Moscow, Leningrad, Kiev, Sverdlovsk and the capitals of the union republics. There is an iron rule in effect here: that of the residence permit. The only exceptions are for a small number of high official posts. This exception does not extend to scientific workers, leading designers, VUZ professors, head engineers of design or head specialists of ministries or departments. Such a "policy" has a negative influence on the effectiveness of scientific and technical progress. Since a large part of the leading scientific-technical and planning organizations are concentrated in Moscow, Leningrad and a few other centers, it turns out that the preparation of the most important

is possible to obtain an "exit permit" to travel abroad, and to obtain a residence permit for those cities. One cannot help but be struck by the fact that thousands of workers in Moscow and Leningrad annually receive the so-called limited residence permit and as many more receive it immediately after completing the vocational and technical school, but this cannot be extended to the sphere of management and science. Why?

The management of scientific and technical progress at the interbranch and branch levels should be based on a mutually developed, very extensive program. Everyone recognizes this, but it is being carried out slowly and not very effectively. What is the reason? We believe there are three reasons to do this: *Reserve* does not have a large enough number of workers with the proper competence or qualifications or the proper talent. In our opinion, the program must be personalized in order to succeed. In the first place, the program must be headed by an individual: scientist + organizer. The programs are headed by the "responsible ministry," that is, they are impersonal. In the second place, the manager of a program should be given the proper authority. But even if he is appointed by a responsible ministry, he has practically no rights. He cannot distribute personnel (including his own), establish organizations, hire, fire, shift resources or create reserves, increase or cut the salaries and bonuses according to the qualifications and reform from the various participating in the program to determine the direction of work, and values of construction work and material and technical supply. In a word, the manager of the program today can only give advice, report and persuade....

In the third place, within the framework of the program one should inflict the interrelations between those who carry out its sections and assignments of scientific and production organizations. We have discussed this in detail above.

Control of scientific and technical progress can no longer be reconciled to formalism and stagnation in the structure, plans and systems for payment in scientific organizations of any profile or jurisdiction. Of the many problems that are arising here, we are mentioning only the sizes of the organizations, the working conditions, the right to search and risk and the system of contracts.

#### The Size of Scientific Research Institutions

There are unknown reasons, but perhaps because of the "allergic reaction" of financial agencies to the increase in management personnel, a regular scientific institution is recognized only as a large one which has no less than 500-600 people (and even better--2-3,000 workers). There is the opinion that science can be moved forward only en masse: the more people, the more science. There are many examples of consolidation in which two or three and very often four or five scientific organizations have been merged into one, and this was welcomed from all sides. But in spite of all this, the sum of the components has turned out to be of much--to go much lower. Sometimes there has been no sum at all.

In our opinion, the number of personnel of scientific and scientific-technical organizations should be determined according to only one criterion--scientific controllability. And this is somewhere within the range of up to 100 people. Beyond this there arises something like a federation, association, corporation, and so forth. Such associations are not rare in modern science with its complex technical equipment, the combination of many branches of knowledge, the coming together of laboratories and design bureaus, and the entry of assembly work directly on the desk of the researchers. Working according to a unified target program these associations can be on one territory or on different ones, but they must include independent scientific organizations headed by scientific directors and their deputies--the organizers. Scientific organizations with the same name are undoubtedly useful (not to be confused with those that duplicate one another). For they will advance scientific and technical progress on the basis of creative competition! The worst thing for science is the lack of scientific disputes, a monopoly in judgments. How can one avoid this if our entire great country has only one scientific (scientific-technical) giant in any specific area of science or technology.

In socialist countries such as the GDR, Czechoslovakia, Hungary and others there are few institutes with more than 15-20 scholars, and they are of great international renown. The main advantage from this is the scientific independence of the leaders, their reputation and, of course, important achievements in science and technology. How important this is for acceleration of scientific and technical progress! We should not like to offend any eminent scientists, but an analysis of their biographies shows that their "stars" have risen not during the period of leadership of enormous institutes, but during those happy times when they were given independence in a small collective.

We are not suggesting that the current giant scientific research institutes be closed. But perhaps it would be worthwhile to think about giving the dozens of directors included in them the right to citizenship. And, of course, the decision concerning the creation of a new institute or design bureau should not be dictated by the criterion of fear of one more director, but the criterion of the scientific maturity of the scholar. And the institutes could be included in production associations or large enterprises, as in departments of VUZes--anywhere where a productive scientist or designer agrees to work.

#### Working Conditions and the Right To Research

A good deal has been written about working conditions. We firmly hold a position of flexible working time for people employed in scientific and technical, including engineering, activity. For only then is the broad path opened up for scientific research which never anywhere can be fit into the framework of "from and to" with a break for lunch.

At one time quite a few people were quoting the judgment of one eminent scholar concerning the inadmissibility of satisfying curiosity at the expense of the state. But why, actually, should one condemn this desire? Who can decide where idle curiosity ends and useful, creative curiosity begins? We

kind of notorious cases where private firms permit scientific associates to study what they find interesting and generate little funds for this. And they do not expect returns today or tomorrow or even the day after tomorrow. It would hardly come into anyone's mind to reprimand private firms for their philanthropy. This means that there is a want of rules for them. Why is such "free will" disadvantageous for us in a socialist country? Is it not the prohibition of free will that is the cause for our backwardness in a number of essential categories, and is it not in the support of free will in spite of instructions, inspections and impediments, that we can find the reasons for success in a number of important areas of Soviet science?

Science and the branch of it called engineering activity are distinguished from production in any form by the nature of probability and the element of risk. According to our data the probability of reaching the goal in applied research amounts to an average of about 80 percent, in the fulfillment of engineering developments--about 90 percent, and in planning facilities--92-95 percent. And it is never 100 percent. This means that it is necessary to plan and evaluate this activity correspondingly, and also to finance it correspondingly.

People might object: even now it is permitted to allot up to 20 percent of the funds for research work and work involving initiative. Yes, it is permitted, but nobody takes advantage of this right. Why? Because such work is rated two or three categories than that which produces an immediate effect, and who is willing to tolerate both material (considerable) and moral harm? In the second place, because this work cannot be fit into the "from and to."

We are far from recommending that labor discipline be slackened in scientific and technical organizations. The discipline should be the strictest here. But it should be scientific discipline, which consists in daily checking: what has been done, what happened, where was the success, where was the failure, what should be done next. I have had the good fortune to work under the leadership of a scientist who asks these questions of every associate every day. True, he did not have 500 under his jurisdiction but only 30 people, but he went to conferences at least once a month.

The right to research and the right to risk should be earned. Far from everyone who enters the door of science can be trusted with it. How does one earn it? By defending ideas, responsibility, conscientiousness, a true thirst for knowledge and a desire to direct it to the benefit of the country. In this connection the contract form of enlistment in scientific and scientific-technical activity seems deceptive. It is widely used in capitalist countries, but there they have sharply negative aspects along with the positive ones. The army of unemployed is being filled by people who have not fulfilled their contract. Under our conditions this danger does not threaten someone who has not fulfilled a contract. The system of contracts for a certain number of scientists, designers and planners would remove many obstacles from the path of creative research and the fulfillment of complicated scientific and technical work in the shortest possible period of time. If someone is frightened by the word "contract" one could call this form an order, although we do not see any great difference here.

The unforgettable Kozma Prutkov repeatedly warned against trying to embrace the unembraceable. And problems of accelerating scientific and technical progress are truly countless, and the number of questions arising here is also countless. But this same Kozma Prutkov taught us to look to the roots. We have tried to take a look at several of these roots, roots which have so far been hidden for one reason or another.

#### FOOTNOTES

1. The author has already addressed this subject on the pages of the magazine. See EKO No 6, 1978, pp 93-110.
2. PRAVDA, 20 August 1985.
3. "Narodnoye khozyaystvo SSSR v 1984" [The USSR National Economy in 1984], Moscow, "Statistika", 1985.

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## RESEARCH PRODUCES ECONOMIC INTENSIFICATION

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 21-31

[Article by N. S. Lidorenko, Corresponding Member of the USSR Academy of Sciences, scientific manager of the NPO "Kvant", Hero of Socialist Labor, winner of Lenin and State prizes (Moscow): "Fundamental Research--The Highest Form of Intensification of the Economy"]

[Text] The Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000 set the task for providing for extensive introduction into production of principally new technologies which make it possible to increase labor productivity many times over, to increase the effectiveness of the utilization of resources and to reduce the material-intensiveness of production.

The revolutionary technologies are based on the utilization of the latest achievements of fundamental research. Using a number of examples of research and development of new energy-generating devices, we shall demonstrate the possibilities of the achievement of the ultimate significance of scientific and technical progress which make it possible to economize on labor, material and energy resources at the same time.

All ways of directly transforming various kinds of energy into electric energy have a common scientific basis. They have no theoretical restrictions on the possibilities of the coefficient for transforming energy. For example, in chemical sources of current it amounts to 30-80 percent, and electrochemical generators--60-90 percent. The very fact of the production of electricity from energy of external physical fields (energy of chemical transformations, solar and thermal radiation) makes it possible to obtain extensive information about external energy manifestations. On this basis today we are constructing not only electric generator devices, but also numerous sensors and systems for transforming information which are extremely promising for application in cybernetics.

### Production of Electric Energy From Chemical Transformations

Each year the world produces more than 10 billion autonomous sources of current (galvanic cells, batteries and so forth) and other energy-generating

services (solid batteries, electro-magnetic generators) which contain up to thousands of tons of high-grade materials which are used in a single piece. In such a partial analysis of these materials, labor expenditure accounts for 10-15% in production, with such high output, in an extremely effective fashion, in the improvement of the economy.

Under the 11th Five-Year Plan the Ministry of the Electrical Equipment Industry began simultaneous, at the plants Industrial and Industrial and a series of efficiency class A100 cells at seven firms, with an output of 100,000 cells per day, within the framework of the standard of the Generalized Electrical Equipment Commission. The new products in the basic analysis of their maximum production have been developed by a group of engineers and specialists of the All-Union Order of the Labor Red Banner of the Ministry of Sources of Current. The special technological equipment required for mass production is created and made in analogous abroad. Along with the two plants of the Ministry of the Electrical Equipment Industry, two plants of the building ministry, as well also began to produce effective sources of current. In 1981 all of them together produced more than 1.0 million cells, and in 1982 --about 1.9 million. The new galvanic cells contain one-third to one-fifth of the ordinary weight of basic materials: manganese dioxide, zinc, carbon, iron and so forth. Additionally, the initiation of the use of solar cells, especially reduced thermonuclear reactors and led to a further significant utilization of existing per unit of electric energy produced by the use of traditional galvanic cells. The claim was simplified: to use 100,000 cells per four square meters.

In order to satisfy the needs of the national economy for sources of current for mass consumption, by the end of 1983, with the old basis of manganese dioxide in the all design, it will be necessary to produce about 1.5 million cells per day. On the basis of 100,000 cells, more than 1.9 million, at a minimum, to construct new plants accordingly. The development of the new design and technologies of the system of battery cells reduces the demand for manganese (a quantity of sources of current to one-third and reduces the high consumption to one-fifth, because of this it is possible to satisfy the population of the country by producing not 2 billion but 1.5 billion new unified sources of current).

During the past 4 years the aforementioned components of current cells of the modernized and a new was developed for restoring (accumulation) of energy in them up to 30-cells, such in a number of areas of application increases the effectiveness of their utilization another 30-fold (in terms of consumption of materials, energy and labor expenditures). It is important to stress, that these modernized sources of current are extremely efficient for the accumulation of energy from solar radiation in time with the help of photoelectric cells. Experimental stations for atomic energy supply, which include solar power stations and new high-voltage galvanic cells are already operating successfully in regions of Siberia and the Far East.

The changeover of the branch to mass production of modernized sources of current, which should be completed under the 12th Five-Year Plan, will involve for an annual savings of more than 24,000 tons of manganese dioxide and 7,000 tons of zinc, 10,000 tons of tin plate, 700 tons of copper and more than 20 million semi-finished of various iron, and it will conventionally increase its 20

people in the country. It should also be noted that this development was the result of the work of the large organizations of the Ministry of the Electrical Equipment Industry in the field of organization of production facilities. Under the 13th Five-Year Plan it is intended to complete the second stage of organization of the production process, which will increase its effectiveness for reducing labor expenditures there. Under the forthcoming five-year plan the branch will reorganize itself with three types of new facilities of plants.

A comparison of the planned output of the production of the branch at present and mentioned above, the branch with products of one Japanese firm and 20 others in the Soviet Union in the production of similar batteries, along with the equipment for the manufacture of the Soviet development model, with respect to the increase in output of the current series (1.5-fold) and with respect to labor productivity (3.9-fold). The main priority from the time of the creation of the first models of the branch of current of this series has not yet been surpassed by a single one of the foreign firms. The Soviet Union sold licenses and equipment for the technology to Hungary, Yugoslavia and other countries.

As a result of the expenditure of capital and labor resources the economic effectiveness of the new devices for batteries and batteries will exceed 10 million rubles a year (with the level of output planned for the end of the 13th Five-Year Plan). About 80 percent of this sum will be obtained as a result of mechanization (reduction of labor expenditures). The remaining 20 percent will be obtained as a result of reducing expenditures of materials, introducing new technologies and methods, which are the result of fundamental research.

### Electrochemical Generators

Two prospects which correspond to the current level of technical capabilities in reducing labor expenditures, materials, energy and fuel, are opened up with the creation and assimilation of the production of electrochemical generators (ECG), which are intended for use in power in transportation energy engineering, electric cars, electric carts, and so forth.

As distinct from the traditional method of current, in electric chemical generators for producing electric energy, they use as reagents not metals or metal compounds but substances that do not conduct electricity which are considerably less expensive and more available: hydrogen, oxygen and especially air, hydrogen. Therefore these generators, providing for continuous generation of electricity from various products of reaction, have extremely low material-intensiveness as compared to the classic batteries and galvanic cells—several times less than with batteries and hundreds of times less than with galvanic cells. For example in ECG using hydrogen and air created in the last 4 years ago has no analogies in the world yet. An electric car using hydrogen and air was exhibited in the All-Union Exhibition of the Achievements of the USSR National Economy. It runs for 150 kilometers without refueling, and replacing the hydrogen tank takes 2 minutes. Other effective systems for transportation energy engineering are being developed on the basis of this.

## Electricity from the Energy of Solar Radiation

For about 12 years the USSR has been operating more than 120 small solar electric stations with an efficiency factor of 10 percent and more than 20 thermal electric power stations with automated accumulation and expenditure of electric energy. The solar batteries were made on the basis of single-crystal silicon and therefore they are considered expensive although in those remote areas where they are operated the proportional cost of their electric energy is considerably less than the cost of electric energy obtained from gasoline generators with the corresponding capacity.

During recent years the volume of research for reducing the cost of solar batteries has increased sharply. The USSR was the first in the world to develop and introduce into production a heterostructure made of a new semiconductor material with an efficiency factor of 20-30 percent that sustains concentrated luminous fluxes up to 1,000 times. The new technologies for producing solar batteries contain prerequisites for reducing the cost of electricity production by a factor of 25-30. Taking into account the fact that the duration of ground operation of solar electric power stations is practically unlimited and the ecological cleanliness is irreproachable, these works are used as a basis for the creation (with satisfactory savings) of larger solar electric power stations both on the ground and in space. The question of creating inexpensive means of accumulating and storing electric energy is on the agenda.

The development of flexible automated lines for producing photoelectric cells from the gas or liquid phase with computer control in the organization of feedback through computers with monitoring of the results of the process, comprise the basis of technological problems facing scientists who are engaged in this important task. In spite of the technological difficulties, this work is being encouraged throughout the world. The USSR envisions the development of plans for "solar houses" for rural regions of Krasnodar Kray, Rostov Oblast, and the Georgian SSR, and solar water-raising installations for the Turkmen, Kazakh, Uzbek and Kirghiz SSR's.

Two alternative variants have been selected for promising developments: the creation of a fully automated mass production of flat modules of solar batteries that use direct and diffused solar radiation and the development of solar modules with concentrators that make it possible to increase the density of direct radiation falling on the surface of the solar elements by a factor of 500-1,000.

The latter variant, which we developed and introduced under the leadership of Academician Zh. I. Alferov, required the creation of a new theory of transformation of superhigh radiation flows into electric energy and the development of special multilayer semiconductor structures. Recently we have managed to manufacture and successfully test new solar cells with linear or superlinear dependency of the generated current on the illumination. The goal of the work is to reduce the production cost of the electric energy that is obtained to amounts that are close to the cost of atomic energy.

A considerable reduction in the cost of "solar" electric energy can be expected as we expand the production of solar cells using the technology for continuously obtaining a fine silicon tape made of melted material.

### Thermal Electricity

A large savings on materials when producing electric energy with autonomous sources can be provided as a result of applying semiconductor thermal batteries with solar, gas or liquid fuel heating. The USSR has developed designs for such batteries with an operating life in excess of 10 years. Here the expenditure of materials on the production of 1 kilowatt hour of electric energy is 1/700th the amount with batteries and several thousand times less than with galvanic cells. Unfortunately, the introduction of thermal electric and photoelectric transformers into production is taking place at slow rates because of departmental barriers.

### The Effectiveness of Fundamental Research

A predictable question: What is the effectiveness of the fundamental research that lies at the basis of the production of autonomous sources of current? The utilization of semiconductor equipment and technology in the world has produced and is producing billions in dividends for foreign firms. This is quite comparable, with the effect from the utilization of atomic nuclear energy for producing electricity. At the sources of the initial fundamental research in both cases were just a few scientists. In our examples the idea of utilizing the photoelectric effect for producing electric energy was developed by Academician A. F. Ioffe (1932). The design and the new technological idea of mass production of alkaline galvanic cells were suggested by the engineer F. Kh. Nabiullin. As always, the initial ideas were subsequently developed by enthusiasts, coauthors and workers, but the economic effectiveness of the initial creative thought is immense. If one compares it to the savings of an industrial enterprise of an average level in rubles per 1 ruble of production expenditures, one must admit that individual scientists and creative working collectives have an effectiveness that exceeds expenditures on research thousands of times over. Such economic prospects are associated only with the work of outstanding scientists, good scientific collectives, and with a good and delicate algorithm of the control of the entire process of "fundamental research-technology-production."

### The Scientific Production Association--The Best Organizational Form of Ties Between Science and Production

In the preceding section we named only a small number of research and development projects that have been carried out in the past 10 years by scientists of the All-Union Scientific Research Institute of Sources of Current. The fairly high rate of realization of the results of the research depended largely on a reduction of the cycle "Scientific Idea-Technology-Production." For 6 years our collective has been operating as a part of a scientific production association. The NPO includes two institutes, three experimental plants, one design bureau and a number of laboratories at plants. According to the documentation, the NPO operates eight plants of the branch. It is precisely the structure of the scientific production association that

has made it possible to rapidly assimilate the latest technologies and the production of solar batteries to be used on the ground, the production of electrochemical generators and a number of other items, individual examples of whose application are presented in this article. The structure of the NPO provided for satisfactory growth of the volume of NIOKR--during the past period it has more than doubled, while the number of personnel has increased by 19 percent, and the volumes of industrial output have increased by 8 percent. During past years the NPO has completely fulfilled its annual plans for NIOKR and production plans.

But it is not only the indicators that have been cited that should determine the criteria for the activity of such an economically effective structure as the NPO. It is necessary to take into account that all products of the NPO are the latest products created in the USSR. In a number of cases these products are being created for the first time in world practice. Thus among the latest technologies in the world is the technology for producing electrochemical generators, solar batteries and improved chemical sources of current.

A number of ministries are not developing NPO's sufficiently and are doing little to improve the structure of management. The two-unit structure of management has not been introduced and the three-unit structure (ministry VTO--NPO) sharply reduces the independence in making scientific and technical decisions and correspondingly affects the effectiveness of the activity of the NPO.

The growth rate of the most effective organizational form which reduces the cycle "Science-Production" still does not correspond to the crucial nature of the problem. There should also be further improvement in the methods of encouraging enterprises that introduce new technical equipment. The actually existing slow rates of introduction which do not depend on the scientists reduce the interest of scientific collectives to a minimum. It is necessary to eliminate restrictions for contributing to the introduction of inventions on managers of enterprises that introduce new technical equipment since these restrictions impede scientific and technical progress. It would apparently be expedient for the USSR State Committee for Inventions and Discoveries to develop a scale of bonuses not only for the authors of inventions, but also for scientific collectives in which these authors invent and introduce things, especially for highly effective development with savings of more than 100,000 rubles. There is now an upper limit on the honorariums for authors of inventions, regardless of the amount of the savings. And the authors of the inventions, as a rule, do not receive the maximum sum envisioned by the existing provision. Therefore it is necessary to study and eliminate factors that infringe upon authors' rights.

Indicators of the effectiveness of the NPO should, in our opinion, reflect the effectiveness of the utilization of its products in other branches. But the corresponding provisions have not been developed with respect to NPO's in our country. There are also unutilized organizational possibilities of accelerating the cycle "Science-Production" in the creation of comprehensive brigades consisting of scientists from the USSR Academy of Sciences and workers in industry (NPO).

Recently, Ministers have insistently drawn the attention of economists to the best and most utilization of the results of fundamental research in order to make principally new technologies and products, bearing in mind that this must be the basic "one for intensification of the economy." They have published a number of directive documents directed toward reducing the cycle of "research, development-production." But many ministries have not yet created structures which are capable of fulfilling this task. It has been felt, such structures, in our opinion, are large NUD's.

## EDUCATION OF RESEARCH DEVELOPMENTS (CONT'D)

Novosibirsk EKONOMIKA I ORGANIZATSIIA PREDPRIYATII I TSVYAZI (E&O) in  
Russian No 7, Jul 86 pp 31-32

Editorial commentary: "There Are Developments, But Where Are the It's & O's?"

(Text) The All-Union Scientific Research Institute of Sources of Current is working in an area of science and technology whose influence on scientific and technical progress, on the national economy and on the satisfaction of the cultural and domestic needs of the Soviet people increases each year. It is no accident that our age is called the age of autonomous energy. Without modern medicine and the latest systems of measurement, aviation and space travel would be unthinkable; it would be unthinkable to assimilate the depths of disease, the deserts, the northern latitudes, mountainous regions and regions with difficult access. The world economy shows that every country tries to have his own source of energy. For autonomous energy, nothing is possible to have a supply of energy directly at one's disposal. Even under ordinary conditions the demand for it is increasing. Many people prefer to operate radios, tape recorders and other complicated household items not with the electricity network, but with autonomous sources of current, striving to ensure themselves against interference and fluctuations in current. Scientific and technical progress is pushing the sub-branch forward and forcing it to develop at more rapid rates and contribute to raising the technical level of products of other branches.

Thus the situation with the introduction into production of highly effective new alkaline sources of current seems even more surprising. So far there have not been surpassed by a single foreign firm, as the corresponding note in the USSR Academy of Sciences N. S. Liburko writes in his article. But with the priority of their creation, why has the Ministry of the Electrical Equipment Industry not developed mass production of these in the past 10 years? Why has work on fundamental reconstruction of the production of batteries not become widespread? After all, the quality of batteries does not meet the standards, and the volume of production lags significantly behind the demands of the national economy and domestic consumers. Why are other scientific developments being assimilated so slowly? The editorial staff asked these and several other questions of people who had once been leaders of the sub-branch of the VPO *Soyuzelektmashinstsvo*.

"We shall not answer verbally," categorically announced V. I. Moiseyev, who headed the NPO at one time.

"We request that you submit the questions in written form and we shall study them and try to give you an answer," Deputy Minister V. G. Subachev, who is in charge of the work of the sub-branch, responded more politely.

During those months when the "study" of the questions was being conducted leaders of the sub-branch and Deputy Minister V. G. Subachev were removed from their positions. But the arrears of the sub-branch had been forming for some time. The unsatisfactory management of this branch in the recent period had only exacerbated the negative tendencies, and it is necessary to mention this.

A considerable number of the enterprises of the sub-branch were created in prewar years. Some of them appeared during the evacuation of enterprises from the European part of the country to the Eastern regions. After the war, the plants returned to their home locations, but the production remained in the East. After the war practically no new enterprises were constructed and there were not sufficient investments in reconstruction and technical renovation of existing enterprises. Because of the time that had passed the sub-branch lagged behind the needs of the national economy.

Recently the Ministry of the Electrical Equipment Industry has begun to pay a little more attention to enterprises that produce sources of current. For the 12th Five-Year Plan there was a considerable increase in capital investments in technical renovation and development of the sub-branch. But the capacities will be transformed and increased by the year 1990. Consequently, they will be in operation under the 13th Five-Year Plan. This is why the country will not be able to receive a sufficient quantity of new galvanic cells until 1995.

The manufacturing plants have many problems with the alkaline cells because of the fact that they have not solved the problem with the raw material base. First and foremost it was necessary to organize the production of the basic component--electrolytic manganese dioxide. The Azot Production Association of the Ministry of Mineral Fertilizers in Rustavi began to do this. The production is not within the profile of the enterprise, there is no interest in it, and there are no specialists. As a result, the quality of the electrical manganese dioxide (EDM) is extremely poor. No sooner had the new cells been put up for sale than they received severe criticism. Their quality was tested by many levels right up to the USSR People's Control and Procurator's Office. Recently the quality of the raw material has improved somewhat, but the Rustavi PO has not yet solved all of its problems and is in need of additional attention from the ministry.

The need for the remaining components of the raw materials of the new alkaline cells are not being fully satisfied.

The problem of raw material is also crucial in the production of other items, for example, batteries. Up to this point batteries are being produced in mass quantities using ebonite monoblocks, although we should have changed over to propylene monoblocks long ago. Ebonite blocks are considerably thicker and

heavier. But the chemical industry promises to cover only part of the need of the sub-branch for polypropylene. The remaining batteries, up until the end of the five-year plan, will be produced in ebonite monoblocks.

Or take the highly effective separators for batteries. An insignificant complex material. But the chemical industry does not provide it. The All-Union Scientific Research Institute of Synthetic Resins (City of Vladimir) is failing to meet the deadlines agreed upon for completing the development for polyethylene separators.

The sub-branch is part of the fact that about 65 percent of the batteries have been certified for the State Emblem of Quality. But an inspection by the people's control agencies has shown that the Emblem of Quality is being conferred illegally. The Gosstandart has removed it from 17 kinds of batteries. Penalties have been imposed for producing poor-quality products on the managers of the Taldy-Kurgan, Kursk, and Leningrad battery plants. Thus we have the task not only of assimilating the new battery equipment, but also significantly improving the quality of the traditional equipment.

The Basic Directions for the Economic and Social Development of USSR During 1986-1990 and the Period Up to the Year 2000 sets the task of comprehensively economizing on fuel and energy resources and expanding the utilization of nontraditional renewable sources of energy. The Institute of Sources of Current has a scientific stockpile in this area, but the branch is not working sufficiently on utilizing it. The sun is a practically inexhaustible source of ecologically pure, noiseless energy. It is not surprising that throughout the history of mankind people's gazes have always been directed toward the energy of the sun. The achievements of the scientific and technical revolution make it possible to actually resolve the problem of its utilization.

But the devices that accumulate solar energy are still quite costly since they are made on the basis of single crystal silicon and their efficiency factor is not high enough. How does one reduce their costs and increase the efficiency factor--this is a problem which is awaiting a solution. In order to organize series production of installations for solar energy which have a commercial advantage, we need principally new technologies, for example, for obtaining thin film thermal elements to replace single crystal silicon wafers. This area is being developed in conjunction with the scientific research institutes of the Ministry of Nonferrous Metallurgy. A synthesis of film large block structures and amorphous silicon films is promising; work on this is being conducted in conjunction with institutes of the USSR Academy of Sciences and the Ministry of Nonferrous Metallurgy.

In electric energy for means of transportation great hopes are being placed in electrochemical generators using hydrogen and air. We created such a generator before other countries did. But as a catalyst for the chemical processes in these generators we use platinum, which immediately placed restrictions on their production. There arose the problem of replacing the catalyst with a less expensive one.

Electrochemical generators can pay for themselves in devices for accumulating energy, in computer networks, and in systems of measurement for avoiding interruptions in processes that are being carried out.

Scientific and technical progress, while raising the level of the sub-branch of autonomous sources of current, should also raise the level of the consumers. There have been large losses in electric circuits, electric engines and tape advance devices of tape recorders. Because of the imperfection of the design even the rewinding of the tape in tape recorders requires excessive expenditures of energy. The need for energy can be reduced when the items are being improved.

The sub-branch produces a wide range of items: from miniature galvanic cells the size of a small button (without them it would be unthinkable, for example, to have electronic watches) to accumulator batteries weighing several tons for atomic electric power stations. Their total capacity is much more than the introduction of new capacities by the Ministry of Power and Electrification. But such an unexpected ratio should not cast a spell over us. Those capacities which will be introduced by the Ministry of Power and Electrification will be kept in operation for decades and will gradually be increased and accumulate. Autonomous sources of current serve for tens, hundreds and thousands of hours and after that they are exhausted. They must be restored. Thus it is even more important to economize on their utilization. But it is also even more necessary to accelerate the assimilation of effective new alkaline galvanic cells that are being created in the Institute of Sources of Current. The institute has now been transferred from the sub-branch to the jurisdiction of the technical administration of the Ministry of the Electrical Equipment Industry. One must assume that the conditions will be improved for realizing its developments. The branch will pay more attention to it. The minister of the electrical equipment industry Yu. A. Nikitin, who is in charge of questions of science in new technical equipment in the branch, promised that he would comment on the new situation in the work of the institute. Unfortunately, he has not yet had time to keep his promise. We must hope that the branch will respond as quickly as possible to this article.

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## FUNCTIONS OF PERSONAL COMPUTERS RELATED

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 35-42

[Article by Yu. P. Voronov, candidate of economic sciences (Novosibirsk): "What Is a Personal Computer?"]

[Text] The documents of the 27th CPSU Congress set the task of accelerating the development of the output of personal computers. The efforts of labor collectives that produce personal computers are not sufficient to carry out this task. The new kind of computer is penetrating into all spheres of production activity, daily life, education, culture, and public health.

It is not enough simply to produce thousands and millions of personal computers: it is necessary to create favorable conditions for their utilization and to prepare future users for this. We are speaking primarily about psychological preparation. Up to this point, not so many people know what a personal computer is and where it can be used.

A no less difficult task is to prepare the national economy for the use of personal computers and promptly include in the work of enterprises and economic organizations the ability to accept the capabilities offered by the new means of intellectual labor as fully and effectively as possible.

In the articles offered for your attention Yu. P. Voronov and G. R. Gromov touch upon the complicated complex of problems associated with mass introduction of personal computers during the course of the current five-year plan.

The name "personal computer" includes four types of computers: office, home, training and scientific research. All four types are similar in design, capabilities and even external appearance. Let us begin with the last.

When one sees a personal computer the first thing that catches the eye is the transistor television screen. And so it seems that this is the main part of the computer. But that is not so. The television screen is an external device of the computer, and the computer itself, which is the size of an encyclopedia, is located in such a way that one does not notice it immediately. It can be built into a television set if the size is increased somewhat. Additionally, the personal computer includes a keyboard and two devices—the external memory and the printer.

It sometimes happens that the computer itself is combined with the keyboard or the external memory device. The entire personal computer is placed on a desk and when it is put together as well as possible it occupies as much space as an electronic typewriter.

The most similar are home and training (teaching) computers. If one is to speak about models that are currently being sold abroad, these machines cost \$700 to \$1,000 (including applied programs--\$100 to \$200). The internal memory of these machines is 64 kilobytes (about 40 typed pages). The external memory is from 100 to 500 kilobytes (that is, from 60 to 300 typed pages). These machines are not very fast. Training machines are distinguished from home machines by the fact that they have somewhat greater requirements for the user and, of course, by the set of applications. At the present time in the United States for every personal computer that comes into the sphere of education there are five personal computers for home use. In our country, obviously, this ratio will be different: personal computers will be supplied first to VUZes, teknikums, vocational and technical schools and general educational schools. The program for introducing computers into the school was presented by the compiler of this program along the line of the USSR Academy of Sciences, Academician Andrey Petrovich Yershov (see, for example, EKO, No 2, 1985). The program envisions consistent expansion of the network of computer labs in the schools of our country. The goal of universal computerized education is to transform programming into a second kind of literacy so that each schoolchild will treat a computer as he does one of the natural, ordinary objects of daily use. In Western countries and above all in the United States the main hopes are being placed in extensive dissemination of home computers that are used for games, for reference, for housework, for processing the texts of letters and statements, and so forth. The volume of sales of these machines in the world should reach tens of millions per year. The market for home computers, according to predictions, will be comparable to the market for private automobiles. To be sure, these predictions have not been justified yet.

The basis of the market for personal computers is still machines for office work. The typical size of the internal memory for machines of this class is 256 kilobytes (roughly 120-150 typewritten pages), and the external memory--0.5 to 1 megabyte, that is, from 250 to 900 pages. The cost of office (institutional) personal computers is approximately 3-5 times as great as that of home and training computers, including the applied software--7-10 times. The increased cost is explained by the fact that personal computers in offices contain the archives of documents with the storage in the machine's memory of all documents that are suitable to be printed, automatic construction of graphs and diagrams. Personal computers for offices, as a rule, are capable

of being combined into a unified network that it is possible to send a document from one work position to another without putting it into print. The most popular office personal computers now are from the firms Apple and IBM. In our country there is a model of an office personal computer which has long been assimilated into production--the Iskra 226. The next in line will be the extensive introduction of the Agat personal computer which will be used both in training and in office work.

In the opinion of specialists extensive introduction of office personal computers into our institutions is being held up not so much by the capabilities of production as by the lack of preparation of the basic mass of employees and engineering and technical personnel for using them in their current activity.

Incidentally, there are also various kinds of preparation that are lacking. When one says that a personal computer is oriented toward the untrained user one means mainly a sharp reduction in the demands for preparation as compared to work with universal computers of the third generation when the user was separated from the machine by a programmer and an operator. The requirements for qualifications are reduced when changing over to the work of the user at the terminal, when the operator is eliminated and the functions of the program are narrowed. For professional personal computers there has already been one intermediate stage in the reduction of the requirements placed on the user--the so-called "Professor" computer. Anticipating professional personal computers, they pass through the world market almost unnoticed and domestic industry did not have a chance to react to them. By now "Professor" computers have been crowded by personal computers.

Externally, the "Professor" computer reminds one of a teletype with an expanded keyboard, with an indicator of the type of "running line" added, and with a small television display established on top. The main merit of "Professor" computers is obviously the overcoming of the psychological barrier between computer equipment and the large army of rank-and-file scholarly researchers.

The author of these lines managed within a year in the evenings 1 or 2 hours a day to work on a "Professor" computer of Italian production, the Olivetti R6069. For the content of the work there was no need to do calculations--it was only text processing: literary and semantic editing, entering and removing words, sentences and whole paragraphs, and changing the sequence of pieces of text that had already been composed.

From this small amount of experience one can draw a basic conclusion: writing on a "Professor" or personal computer is different from writing with a pen and paper. The differences pertain not only to the external aspects, but also to the very style of work with the text. For instance, moving a paragraph from one page to another is quite permissible by the "cut and paste" method, that is, using scissors and glue. But once this is done a couple of times the article becomes an unreadable rough draft that is stiff from the many times it has been glued. Therefore even when moves the paragraph the first time one has in mind that there cannot be many of these operations. This limits the possibilities, but at the same time it disciplines the writer.

but now, having become accustomed to working with an impediment that holds you back so much, you receive an instrument with which you can see a clean copy of an edited text at any time. At first you simply amuse yourself with this, printing intermediate copies, even when common sense says they are not necessary. But then the ease of making corrections plays the following trick on you: you make them whether they are needed or not, distracting yourself from truly serious work. Only a month later is the necessary balance established between the machine's capabilities and the editor's needs.

The personal computer can produce an especially great leap in productivity when compiling bibliographies, dictionaries, reference works and indexes. The main area for "information-bibliographic" utilization of personal computers will most likely be the preparation of an information base for self-education and training, mainly through correspondence. Initially the user selects certain titles of books and articles and then makes abstracts of them which are then transformed into a combined text devoted to the subject under study. Such machine abstracting is much better for assimilating material than reading the text of lectures or the text of a book, and it introduces an active element into training.

The most complicated and expensive are personal computers intended for scientific calculations. They cost twice as much as office computers and the capacity of the main memory is a half a megabyte, and the external memory—5-10 megabytes. A considerable part of the cost of the machine is the cost of applied programs, the packages being specialized for various kinds of scientific research. The utilization of personal professional computers in scientific research activity increases the labor productivity of the scientific associate primarily through keying into the personal computer routine operations of processing text, constructing graphs and so forth. Of course the personal computer will play no small role in accelerating the calculations. The proximity of the computer device to the user makes it possible to considerably increase the number of variants that are considered.

But the personal computer for scientific calculations is also characterized by the fact that they are not oriented toward the untrained user. It is precisely this feature that distinguishes personal computers from other kinds of computer equipment.

In the second issue of the magazine MIKROPROTSESSORNYYE SREDSTVA I SISTEMY for 1985 an announcement was published of the first domestic home computer, Elektronika BK-0010. The first batch of these machines was sold through the Leningrad and Minsk Elektronika stores at the beginning of 1985. The home microcomputer is intended for engineering and mathematical calculations, for the creation of various kinds of information and research systems (catalogues, reference works, notebooks), for studying foreign languages, for entertainment programs, games and so forth. Initially the Elektronika BK-0010 computer cost 840 rubles. It is intended to reduce this price to 550-600 rubles. It is quite possible in the future to reduce this price to 150-200 rubles.

The speed of the Elektronika BK-0010 is 300,000 operations per second and the size of the memory is 16 kilobytes. The memory can be expanded to 28

kilobytes by using part of the memory device that is intended for the screen (display). The only external device the computer has is the keyboard within which it is located. It can be hooked up to any television set which has "video" input and a domestic cassette tape recorder. The television set performs the functions of a display and on the tape recorder one can record sufficient quantities of information that are not necessary for current use.

The conditions for the utilization of the personal computer coincide with the ordinary conditions for the operation of household equipment: television set, radio, washing machine. The purchaser, when acquiring it in a store, reads the instructions and begins to operate it without programmers or operators. If it malfunctions he goes to the repair service: a workman comes to the home or the personal computer is put into a repair shop.

The television set that is part of the computer is called a "display." This word existed in the English language long before computer equipment did and has been translated: exhibit, demonstration. The replacement can be explained: "Tele" in the word "television" means "far," and the computer displays what is right there. The second part of the word also dropped away. Now the word "display," even in the English language, more frequently means "computer screen" than it does "exhibit" or "demonstration."

There is another reason why the display cannot be called a television set. In many personal computers (with the exception of home computers) there is no television presentation of the video signal. The television standard developed to increase the stable transmission of the picture turns out to be uneconomical when there is neither translation nor reception. Therefore for many applications personal computers use their own scanning systems. But when a personal computer is acquired for the family, the purchaser wants to pay a little more if the display of the home computer can also be used on an ordinary television set. Taking this into account the domestic home computer in the Elektronika BK-0010 uses an ordinary transistor television set for display.

The external memory of the personal computer is offered in two varieties—on floppy disks and on a domestic cassette tape recorder. The selection between these is again determined by the sphere of application of the computer. Under household conditions it is best to use a tape recorder and at work—floppy disks. The capacities of these devices depend strongly on the type of tape recorder and disk drives that are used, and the sizes also vary a great deal from the size of a personal suitcase to a slot in the same display where one is to place the disk on which it is possible to record almost a megabyte of information.

A typewriter is rarely used for printing. These are replaced by dot-matrix printers which are capable of producing not only symbolic, but also graphic information.

The world capitalist market for personal computers is now divided among a few large firms. Three-fourths of the sales of personal computers, if measured in units, go to four firms: Commodore, Texas Instruments, Apple and IBM. The most widespread have been personal computers of the Commodore firm which

distributes on the market relatively inexpensive computers for home and school. These machines have played the role of a kind of bridge between television games and more complicated technical devices for which the rank-and-file consumer is willing to pay his own money. While in terms of quantity the machines from the Commodore firm comprise more than one-third of the personal computers that are sold, in terms of value the firm accounts for only one-12th.

The firm Texas Instruments produces various kinds of specialized personal computers for business accounts and engineering activity. The IBM has a popular personal computer for scientific calculations--the IBM PC. When they were just beginning to sell it they had hopes of extensively introducing the personal computer into household work and daily life. But three-fourths of the IBM PC's were purchased by programmers in order to write programs at home for other computers. In terms of total value of sales the IBM PC holds first place, but in terms of quantity--fourth place.

The most widely known firm that produces personal computers is now the Apple company. Sometimes personal computers are completely equated with products of this firm, which is incorrect. The two engineers who formed the Apple firm actively utilized Western propaganda to demonstrate the capabilities of the simple enterprising individual. According to the version offered by the American press, the first Apple computer was put together in a garage. This popular image of the future millionaire, the worker in his garage lost in his work on a technical innovation, has been exploited since the time of Henry Ford Sr. The legend is intended for ignorant people. To be sure, from the hatching items now available on the market any good young technicians' club could manufacture a computer. The difficulty lies in forming the nucleus of the system software. In this the two engineers playing the game of chance indeed did succeed. But the garage had nothing to do with it. It is simply that the initial ideas that were proposed turned out to be indeed successful for constructing systems software for the personal computer that was intended for the untrained user. In 1983 the Apple firm held 14 percent of the world market of personal computers in terms of value and 11 percent in terms of quantity. The first model, the Apple I, is considered to be unsuccessful and almost nothing is known about it. The Apple II model made a burst forward, and this is what brought fame to the firm. The next model of personal computer produced by the firm has a trademark Lisa, and it was also a commercial failure. The expanded set of functions for office application was not received by the market because of the relatively high price. The new series of personal computers of the Apple firm has the name of Macintosh and is considered to be a success.

Relatively recently the DEK firm came onto the personal computer market. With rich experience in the development of software for minicomputers. According to predictions it is capable of essentially crowding out competitors who now hold firm positions on the market.

The wave of personal computers, in terms of its scope, is significantly exceeding all previous waves of computerization. Its influence is not limited to the sphere of technology, the organization of production or scientific and technical calculations. They will enter our daily life such as in automotive

transportation, television and tape recorders. It is necessary to be prepared for this.

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## POSSIBLE DRAWBACKS OF COMPUTERS SUGGESTED

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMISHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 43-50

[Article by G. R. Gromov, candidate of technical sciences, responsible secretary of the magazine MIKROPROTSESSORNYYE SREDSTVA I SISTEMY (Moscow): "Caution: Computers!"]

[Text] Today a good deal is being said and written about personal computers (PEVM's). Some people see in them an instrument for increasing labor productivity for people employed in institutions, design bureaus and scientific laboratories. Others see a simple-to-operate, universal, flexibly adapted instrument for controlling shop-automated equipment, and "informational nucleus" for systems like the GAP, ASU, TP and so forth. Finally, now almost everyone agrees in one form or another that it will be practically impossible to train the future generation of graduates of secondary schools, GPKU's, tekhnikums and VUZes in an era of universal "computer literacy" without personal computers.

It took more than 5 years of energetic efforts for the understanding of the critical need for mass production of "machines for individual processing of the information" as personal computers are sometimes called to be implanted in public awareness: the organization of all-union conferences and regional seminars, the publication of books, the delivery of lectures and articles in the press. But then....

Then the cautiously negative attitude toward personal computers ("Who needs this electronic toy?"; "We do not have time to play games") was suddenly replaced by a special form of "personal computer euphoria" which was considerably more dangerous to the success of the matter. Plant and entire ministries began to compete zealously in their predictions for the output of tens and hundreds of thousands of personal computers which, as it turned out, they were prepared to begin producing immediately (of course, if they were allotted the corresponding funds for precision equipment and other resources that were in critically short supply). At the same time articles in the press were shot through with announcements of expected two- and three-digit figures of the increase in labor productivity from the introduction of personal computers the new "miracle machines"....

But still how pleasant and sweet it is to live during those happy moments of anticipation of a miracle! None of the difficult problems are pressing on one's shoulders yet, or they do not seem so painful. All one need do is wait a little while. A couple of years...and there will be plenty, in these iron "problem-solvers" and everything around will become, in the song, "blue and green." One can read about this (without any irony at all) even in authoritative scientific publications, for instance "in independent personal computer is suggested which will resolve...social problems" (bulletin journal of the VINITI of the USSR Academy of Sciences and the USSR State Committee for Science and Technology, series "Automation of Production and Computer Technology," No 5, 1981, p 17).

About 5 years ago in a similar situation, which arose at the time at the level of the ASU, the director of one of the institutes of the Novosibirsk Akademgorodok figuratively, knowing about the local weather conditions, explained to his colleague who was looking joyously at a long-awaited schedule order for a computer: "You are like a person out in the freezing cold who has had warm water poured down his neck. At first you are warm, but...."

Today, when the attitude toward the "personal computer phenomenon" at all levels of management of the national economy has sharply "changed sides," it is necessary to change the tone of the discussion of the problem just as sharply. It is necessary as quickly as possible to turn away from the sparkling literary outbursts in the press vividly describing the future advantages of the introduction of personal computers, which are inevitable in the stage of fighting for public interests in the problem, to a more, more-handed evaluation of the real volume of work which will have to be done in the immediate future in order for the total economic effect from the planned large-scale introduction of personal computers not to turn out to be negative under the 12th Five-Year Plan.

According to the apt remark of Academician A. P. Yershov, the most reliable method of closing one's eyes to the difficulties of future problems is to regard the personal computer simply as a smaller version of the traditional "large" computer. Although at the present time "direct" work of the specialist with the machine is becoming more and more widespread, still computer equipment is linked in the mind of the average person with the computer center and a considerable number of service personnel. Personal computers intended for the individual user do not eliminate programmers as such. Just as universal literacy does not remove the need for philologists, universal computer literacy does not reduce but, on the contrary, increases the need for highly skilled programmers.

At the same time, with production volumes in the hundreds of thousands and even millions of personal computers, one cannot count on having a professional programmer next to each of them. And it is even more unrealistic to count on having stable service personnel for computers--operators and repair workers--since the personal computer is oriented toward direct work with the user. Moreover, when millions of machines are produced each year there will be simply no place to find this quantity of service personnel.

## The Service Network

The economic advantages from introducing personal computers into any of the aforementioned areas of professional applications are only potential advantages. Whether or not the many billions of rubles spent on purchasing and producing hundreds and thousands of professional computers will produce the expected increase in labor productivity depends on a whole number of scientific, technical and socioeconomic factors, but first and foremost on whether or not the computers that are developed will work.

As distinct from all other types of computers, whose operation presupposes the existence in the organization that acquires the machine of a brigade of service personnel (engineers and technicians—electronics experts, programmers and so forth), personal computers are oriented mainly toward the so-called "nonprogramming professionals"—specialists of the national economy who are interested in using computers but are unfamiliar with the machine. These specialists who are "one on one" with a computer do not want to know anything about servicing it. Therefore the manufacturers can no longer shift to the shoulders of the users even a small part of the burden of keeping their item operable.

At the same time, it sometimes make no difference to the user how one provides for the high level of readiness of the professional personal computer for daily use: through the production of highly reliable components that require almost no repair or a developed network of operational technical support for the computer by the consumer. For example, with a telephone call it is possible to diagnose and replace in a couple of hours a block or component of a personal computer that is broken down. In foreign countries, in order to achieve the coefficient of operational readiness of personal computers that is set by the conditions of competition on the world market, each firm has its own economically optimal balance of funds expended in production for increasing the operational reliability of the personal computers, on the one hand, and the development of a firm system of service after the sale, on the other.

For an approximate estimate of the amount of necessary resources consumed by the computer service network one can use the example of the two largest American computer firms—IBM and DEC: At the IBM firm about 10 percent of the overall number of workers are employed in service work (more than 35,000 people) and at DEC—about 25 percent. The greater the reliability of the item, the less, correspondingly, the load on the network of technical service enterprises and vice versa. But in this case a considerable difference in the load on the service network is determined to a considerable degree also be the circumstance that the DEC firm produces main mini- and microcomputers which are used directly in offices for controlling technological processes, scientific experiments and so forth. That is, in places where it is necessary to have considerably more efficiency in service.

The level of service and the reliability are the main parameters by which the "natural selection" of personal computers takes place on the world industrial market today. This circumstance, in particular, explains to no small degree that that which is difficult to explain from the outside that, for example, in

the American industrial market users prefer personal computers of the IBM firm to dozens of compatible computers from competitive firms which offer less expensive personal computers with technical characteristics which, as a rule, are equal to and in a number of cases significantly superior to those of the IBM machines. The service network which has been created over decades explains everything. It turns out to be much more difficult to create an infrastructure for technical service than it is to organize mass output of microcomputers.

As was noted in the papers at the 9th International Congress on automated means of processing information (IFIP-83), the country, which is beginning a process of mass computerization, should concentrate material and technical resources on solving the main problem of this stage: creating and developing at more rapid rates an infrastructure for program and technical service for microcomputers.

#### Renting Computers

The difficulties in developing a ramified territorial infrastructure for technical service of mass items of new technical equipment, even if they are not as complicated as computers, are generally known. For many years now color television sets, refrigerators and passenger cars have provided journalists with shining examples of type of problem. The difference in this case consists, possibly, only in the fact that the hapless owner of a television set, tape recorder, motorcycle, refrigerator or Zhiguli will have to go, if necessary, through the newspaper to the ministry or through acquaintances to "Uncle Kolya," but he will not rest until the equipment which he has purchased by "his own blood" is restored to its previous working condition. At the same time, for a considerable proportion of the state fleet of microcomputers, which are still being produced by the plants without any indicators of any serious concern about developing a service network, the first time they break down means, as a rule, "eternal rest."

Under the existing conditions the rates of increase in the output of microcomputers should be determined not so much by the production capacities of individual plants or the branch as a whole to "drive up the gross output of computers," but by the economically substantiated synchronization of the growth of the annual volumes of their production with the rise in the level of consumer characteristics of the products that are produced: the level of operational reliability and completeness of the sets that are delivered, on the one hand, and the real capabilities of the branch to provide all the manufactured machines with skilled technical service, on the other.

The real load on the network of computer service depends first and foremost on the reliability of the machines that are produced. The management of the branch receives (with this method of assigning planning indicators) the possibility to maneuver internal resources: any technical decision which increases the reliability of computers thus creates the possibility for the plants of the branch to produce correspondingly more machines with the same expenditures on service.

With another approach to planning it becomes the legitimate norm to produce "pomelogs" computers which are not provided with service. A paradoxical situation arises here: the production plan includes precise sums of money which are intentionally lost for the state, which will then be spent (strictly according to the plan) on "silicon scraps" for warranty service for the doomed electronic machines.

What is economically significant is not the planned indicator that is registered today of the volume of production of computers calculated in billions of rubles (or hundreds of thousands of machines), but the fleet of computers that actually exists in the country. How within the framework of the existing indicators does one separate the "wheat from the chaff"--the unworkable machine from the existing fleet--and correspondingly reflect more precisely the effectiveness of the operation of the computer industry in the reported economic indicators? How does one link the economic well-being of each plant and the computer industry as a whole with the interests of individual organizations and branches that consumer computer equipment?

One of the most realistic organizational and economic solutions is rental.

At the present time, the user organization, as a rule, purchases its own computers and then, after the "purchase-sales" the document is completed, it independently runs through this "electronic property" however and as much as it can. All known, mainly legal, means of postsale pressure on the manufacturer for poor quality products or an effective service--complaints, documents and so forth--as experience shows, are not very effective because of a complicated set of reasons.

It seems that it will be possible to radically change the nature of economic relations of "manufacture-consumer" in the area of computer equipment only with the complete rejection of the existing mechanism of one-time calculations of the "purchase-sales" type and changing over to a system of payments for computer services that are spread out over time, that is, computer rental. This way the branch will receive money from the consumer and, correspondingly, be responsible to the state not for everything "dispatched to the consumer," but only for working machines. For the first time it will be possible to transfer money to the plants only for that part of their products which are working for the consumer at the given time and therefore it will be possible actually to influence the level of labor productivity in the consumer organization.

How is this done? Enterprises of the national economy, having received funds for computers, will no longer purchase machines for the full cost as has been done up to this point, but rent them from the branch that produces computer equipment. As long as the machine is functioning the rent for it will be paid. When the machine is no longer operable because of incomplete delivery or simple malfunctioning, the rent, naturally, not be paid until the item's ability to operate is restored.

Under these conditions, if one plant produces more complete items of equipment which are more reliable than those of its neighbor, for example, naturally with a comparable annual production volume it will receive considerably more

rent from the consumer since there will be considerably rarer instances when the machines are not operating because they are waiting for hatching equipment which is in short supply or for repair.

In the final analysis this will make it possible to create that economic pressure on the computer industry that is so necessary to force them to increase the reliability of mass models of computers and accelerate the development of the service network. For the first time it is possible to pay the manufacturing enterprise not for "computers in boxes" and not for the "document of start-up and adjustment," and not for the "computer repair," but for a working machine.

For technical equipment, obsolescence begins considerably before the physical wearing out does. Therefore the full time during which the consumer agrees to rent the given model and, correspondingly, the overall sum of payments to the plant for producing machines will be determined directly by the technical level of the design of the computer. The more advanced the data processing technology that is included in the architecture of the machines that are produced, the greater will be the period before they are obsolete and consequently, the greater will be the overall sum of profit obtained by the plant from renting this type of computer.

After the organization of the branch responsible for renting the computers no longer receives orders for the given type of machine, a document of "complete obsolescence" of the item is registered.

The requirements on the technical level of data processing systems differ in various consumer organizations. Therefore it is apparently necessary to envision a situation where a consumer organization which has the funds for a given type of computer, for example, having rented it for more than a year, refuses to extend the rental agreement. The reasons can vary: having the opportunity to rent better computers, changing the profile of the work that is done, and so forth. Computers released this way go on to the "rental market" where an agreement is concluded under direct ties among the immediately interested organizations.

To this point computers, especially small computers of the mini and micro level for which the Central Statistical Administration does not (and cannot!) demand a report on loading, after the first breakdown can frequently gather dust for years somewhere in the basement and still be counted on the books of the enterprise until the time comes when it is permitted to write it off. During all this time it is formally going through the channels of state reporting as an operating unit of the computer fleet. It is apparently still impossible to estimate how many of these "dead computer souls" there really are.

It is clear that even today it is necessary to take a decisive step toward increasing the effectiveness of the utilization of computer equipment throughout the entire front of interaction of "computer industry--consumer."

it is difficult to hope for success of the program for computerizing the national economy until the economic interests of the computer industry and the computer consumers coincide in principle. Renting computers is only a first step along the path toward overcoming these contradictions.

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## POSSIBLE DEVELOPMENT OF FISHING INDUSTRY SUGGESTED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 51-68

[Article by V. N. Krasnokutskiy, candidate of economic sciences, deputy general director of the Kamchatrbyprom Production Association (Petropavlovsk-Kamchatskiy: "The Fishing Industry: Problems and Strategy")]

[Text] One recalls a fragment from the story by E. Uspenskiy, "Three People From Prostokvashino" in which they are looking for sources to finance a cow. The hero of the work, Uncle Fedor, reasonably responds to one of the suggestions: "In order to sell something unnecessary it is first necessary to purchase this unnecessary thing...." One can see an analogue in the situation which now exists in the economy: in order to regulate something, it is first necessary to deregulate it.... The USSR fishing industry was not able to avoid the Prostokvashino problem. Because it is a part of the national economy and reflects both the overall achievements and the shortcomings in organization and management. Even though the uniqueness of the processes of catching and processing fish and products of the sea adds certain distinguishing features to production and, consequently, to its contradictions. It is impossible to understand these problems without knowing the history. After all, economics, in principle, is the same history of development, but in the statistics of economic indicators.

At the end of the 1950's the USSR Ministry of the Fish Industry sharply changed its strategy for the distribution of productive forces: the branch was directed toward the assimilation of the bioresources of the ocean. Fishing and processing fleets began to develop more intensively: in terms of quantity, sizes and other indicators. Thus during 1960-1983 the average capacity of a fishing ship increased 3.2-fold and a processing ship--1.8-fold. This could not but be reflected in a larger catch. During the first decade of the assimilation of the ocean (1960-1970) the catch of fish throughout the USSR Ministry of the Fish Industry doubled, and by 1983 it had increased almost three-fold.

The ocean strategy was manifested not only in the increased catch and the increased proportion of raw material, but also in other indicators. This pertains first and foremost to production capital and production capacities that are related to it. While the potential of the canning industry in the

USSR Ministry of the Fish Industry as a whole increased 3.5-fold from 1960 through 1983, the potential of the fleet increased 23.3-fold during this same period and its proportion increased from 7.7 to 51.0 percent. The daily freezing capacities of the coastal enterprises increased by 5.9 percent, and those of the fleet--10.6-fold. There was a corresponding change in the proportions of the production and economic indicators between the shore and the fleet. The center of gravity for production in the fish industry shifted to the ocean. This led to the appearance of the corresponding forms of organization of sea production.

Calculations show that when the fishing areas are more than 1,500 miles from the shore autonomous fishing with ships of the KSTP type becomes unprofitable. For this reason and also because of the development of specialized and cooperative forms of organization of sea fishing, there arose a need for the expedition form of industrial fishing. With this form the fishing ships carry out the fishing continuously throughout the trip and the fishing season, and specialized transportation ships, transshippers, provide for supply and transportation of the final product. This makes it possible to use industrial ships more effectively without diverting them to perform functions that are not properly theirs.

The large and costly fishing and processing fleet, grouped in industrial expeditions, has become one of the main features of the USSR fishing industry. Among its other peculiarities is the combination of Soviet fishing in the East and in the Pacific Ocean. While in 1960 the catch from the Soviet fleet in the Atlantic Ocean was twice as great as the catch in the Pacific Ocean, beginning in 1974 the latter began to take a confident lead. This is related primarily to changes in the international conditions for industrial fishing. In 1977 the majority of coastal countries declared a 200-mile economic zone. The coastal shelves, which are the most productive waters of the Atlantic Ocean, thus came under the jurisdiction of foreign countries. The catch of the Soviet fleet in these waters decreased significantly while at the same time it increased in the 200-mile zone and in the internal bodies of water of the USSR and in the open part of the world ocean, that is, beyond the 200-mile zone of foreign countries. Thus while in 1975 the catch of fish in these zones amounted to 32.8 percent, in 1983 it was only 34.5 percent. The catch in our own fishing zone increased during this time from 29.9 to 36.0 percent, and in the open part of world ocean it more than doubled (from 5.8 to 12.1 percent).

The set of factors influencing the distribution of sea fishing also changed. The main organizational role and the distribution of the fleet in the Pacific Ocean shifted during the period from the middle of the 1960's to the middle of the 1970's from the technical factor to the natural factor, and from the middle of the 1970's on--to international conditions. The material and technical base for fishing today is less and less of an obstacle on the path to the utilization of the ocean's bioresources. As was correctly noted by Academician B. Ye. Bykovskiy, the existing technical equipment makes it possible for us to remove "everything that exists" in a particular fishing region in a matter of hours.<sup>2</sup> Apparently in the future the strategy of fishing should be linked not to a quantitative increase in the fleet, but changes in the production and economic indicators of its operation--reducing

the cost of fishing ships, reducing expenditures on fishing, and further improving the technology for the utilization of biological raw material. It is known that "according to the most modest estimates, as a result of waste during cleaning each year we lose no less than 20-25 million tons of fish and other water resources."<sup>3</sup> The decade and a half that separates us from the time these observations were made is an extremely small amount of time for the technology of processing, and nothing essential has happened in the area, but the world catch has increased significantly during this time. Therefore today's losses when processing fish are almost the same as those mentioned.

The changes that have affected the USSR fishing industry were especially clearly and sharply reflected in the work of one of the largest associations in the Far Eastern region--Kamchatrybrom. Thus with a 4.5-fold increase in the value of the association's fixed production capital during 1966-1984, the fixed capital on the shore did not increase so rapidly--only 1.5-fold. Moreover, the fleet of Kamchatka is being augmented at more rapid rates than the fleet in the ministry and Dalryb as a whole. The proportion of fixed production capital of the Kamchatrybrom fleet in the overall value of fixed capital increased during this period from 63.4 to 92.0 percent, which is much higher than this indicator is for the USSR Ministry of the Fish Industry as a whole. In proportion to the fixed capital, the volume of production in the association is also being redistributed between the shore and the fleet. Thus in 1966 the fleet produced 40 percent of the commercial products, and today--almost 70 percent. During these years the fleet increased the volume of production of commercial products almost 8-fold, while on the shore it increased 2-fold and the fleet increased the production of canned goods 66-fold while on the fleet it increased 3-fold.

Progressive changes have affected many production and economic indicators of the association. Thus the volume of production (for commercial output in monetary terms) increased almost 5-fold. Profit, the summary indicator of financial activity, increased 36-fold while for the ministry as a whole it increased almost 6-fold. There was an essential increase in labor productivity, having reached the greatest among the associations of the USSR Ministry of the Fish Industry. But it should be noted that the growth rates of many of the physical indicators in the association were much worse than the value indicators. Thus the volume of extraction during this same period increased only 2.3-fold (the production of commercial output--4.7-fold), the overall balance of raw material received by the association for processing--1.9-fold, and the output of food products and physical indicators--63.1 percent. The question naturally arises: How could the increase in production be twice as great as the growth rates of physical indicators? Is this not a game of figures and price setting?

The wholesale prices changed twice: in 1975 they increased by an average of 4.5 percent, and in 1982, by 10.5 percent. If translated into commensurable prices the volume of production is still much greater than the increase in physical indicators: 3.7-fold as compared to 1.9-fold according to the balance of the raw material. It turns out that the influence of prices is not the main reason; it is something else. And primarily it is efficient utilization of raw material. The fact that in the association in less than 10 years the output of canned goods has increased 6-fold speaks for itself. Additionally,

while in 1980 only 64.5 percent of the catch went for products in the food industry, last year this proportion exceeded 88 percent. Today 99 out of every 100 tons of wastes from cleaning fish are put to use. The output of mintay and cod caviar alone has increased 4-fold since the beginning of the 11th Five-Year Plan. As a result of efficient utilization of raw material, the yield of commercial products from 1 ton of raw material has increased by 20.6 percent (as compared to 1966—2.4-fold). This was obviously the decisive factor. A certain shortage of fish raw material made it necessary to take a thrifty attitude toward bioresources. The idea about the inexhaustibility of the ocean and rivers was replaced by an understanding of the limited nature of these resources and a recognition of the need to save every kilogram of fish that is caught and to transform it into a final product.

Thus during the past 25 years the structure of the branch and its material and technical base have been determined completely by the development of ocean fishing. At one time this course justified itself. But this led to a situation where the fishing and processing fleet increased at immeasurably more rapid rates than did the coastal fish processing enterprises and the coastal infrastructure which was called upon to provide for the basic production: ship repair, port facilities, and transportation. Capital investments in the fish industry amounted to about 20 billion rubles during the past 20 years. Two-thirds of this amount went to the fleet, which exceeded capital expenditures on fishing port and ship repair and fish processing enterprises taken together 6-fold. The fishing ports and ship repair enterprises were treated worse: the rates of increase in capital investments in them were one-half the amount invested in the fleet. "The absolute leaning in the direction of active ocean fishing inevitably led not only to disproportionately weak development of fishing operations but even to a deterioration of the shore base of the branch and coastal fishing."<sup>4</sup> "Because of the weakness of the coastal material and technical base, Far Eastern fishermen today can no longer handle the large schools of Pacific Ocean salmon that approach the shore."<sup>5</sup> This is perhaps the main negative result of ocean globalism for Kurchatka. One cannot but agree with the author that the time has come to restore that with which the Far Eastern fishing industry began--fishing villages and fishing combines; it is necessary to create a powerful coastal fishing and processing base in order that the fishing not include only "selective" (expedition, mass) objects and regions of fishing, but all possible ones and those that are recommended.

Research (see the work of Moiseyev, G. A. and Shuntov, V. P.) shows that if the industrial loads on all facilities are increased to the optimal, this will make it possible not only to assimilate many kinds of fishing and nonfishing objects and to increase the catch of fish within our economic zone, but it will also be possible to make the bioproductivity of the zone more stable. For these purposes it is necessary to depart from the customary expedition forms of fishing and activate coastal fishing with processing of the catch on shore. But the restoration of the coastline should apparently take place in a new mode of technical development. The current manual labor everywhere under the difficult climatic and social conditions do not attract and cannot draw in specialists in spite of any material incentives. With the existing shortage of labor resources one cannot count on an influx of them and it is necessary to count on only the ones who are already there. It is possible to do the work

with existing forces only if there is mechanization and automation of labor-intensive processes.

The peculiarities of catching and processing salmon, the main product of the coastal enterprises of Kamchatka are such that, while comprising 7.0 percent of the association's overall balance of raw material, it comprises 23.25 percent of the output of commercial products and 40-45 percent of the profit. The salmon migration is brief: the fishing season lasts only 2-3 weeks. Any time missed during this period leads to great losses. One "good" storm during the salmon run, putting the trap nets out of order, can reduce the entire expected effect to nothing. This is why it is necessary to catch all the salmon intended for production in the shortest possible periods of time. Therefore for purposes of insurance, but mainly because of the shortage of receiving capacities, additional floating capacities are installed along the coast: oceanic fishing trawlers, industrial refrigeration ships, and floating bases. The economic losses involved in this increase in receiving capacities are great: the ships are taken away from their fishing regions well ahead of time, and far from all of them are in the immediate vicinity. They are reequipped, prepared for salmon, and then after 2-3 weeks, they return to their previous places.

The salmon cover all these losses, but in essence during this period the fleet is performing the tasks of the shore by flanking the fishing regions. And this is unnatural: the fleet should do its job and the shore should do its job. The ocean fleet should travel the seas and oceans and the coastal enterprises should handle all of the salmon, and not only the salmon but also those small concentrations of coastal objects for which it would be expedient to organize expedition fishing. But today this is only a desire for the future. It would be possible to make it a reality only on the basis of radical technical reequipment of the coastline. It should be equipped with modern dock lines, the processes of fishing and processing should be mechanized, and hydraulic structures should be constructed which would reliably protect these objects from unstable hydrological and meteorological conditions.

Under the 11th Five-Year Plan certain measures were taken to reinforce the coastal base. At the majority of fisheries worn-out and obsolete refrigeration equipment was replaced with new fast-freezing equipment. Five new imported 500-ton refrigerators were put into operation, and in 1985 17 more refrigerators arrived with an overall capacity of 14,500 tons. But the port points along the coastline still do not have docklines, they are poorly equipped with lifting and transportation mechanisms, and those that exist have been in operation for dozens of years already. But the main thing is that the enterprises along the coast still depend completely on the caprices of the Okhotsk and Bering seas.

The fishing industry is participating directly in the implementation of the Food Program, and since November 1985 the Ministry of the Fish Industry has been included in the USSR state agro-industrial complex. Four-fifths of the products of the Kamchatrybrom Association are consumer goods. The main task of all units of the fishing system is considered to be maximum satisfaction of the needs of the population for fish products: the output of products in the

in strict quantities, the necessary assortment, and the highest quality, and deliver very to the consumer in the shortest possible periods of time.

At a certain stage of development has taken place. Some time a quarter of a century ago ship owner enterprises, the transportation fleet and the fishing ports were included in enterprises for catching and processing fish. Everything was plain and clear, as they all had a single goal which covered everything: to catch, process and ship to the consumer prepared fish products. With time, along with development growth and specialization, these productions "broke off" and started an independent life, forgetting about their initial task and purpose. And in some inexplicable way what are essentially auxiliary products began to dictate the conditions to the main production: We will ship this and this we will not; We will repair this, but this is disadvantageous for us.... And the enterprises that catch and process fish turned into barriers and guilty parties.

The shortage of tonnage for shipping the prepared fish products is the most crucial problem in the Far Eastern fishing region. Shipping is provided mainly by Vostochnykhodflot, a specialized transportation enterprise. What today are the interrelations between the manufacturer and the shipper regarding the final goal of the fishing industry? Vostochnykhodflot must pay 1 ruble for every ton of products that is not shipped. But the supplier has to pay 5-8 percent of the value of the products that have not been delivered plus 20 percent of the cost for delivering products of a lower quality. And if the products have not been shipped promptly, it is almost impossible to avoid having their quality deteriorate. Thus the fines for the manufacturer per 1 ton, for example, of lightly salted salmon is 1,453 rubles. Even for the least expensive fish, frozen minkay, it will be necessary to pay 90 rubles per tons, and the manufacturer is completely at the mercy of the shipper, who only has to pay 1 ruble. Is this fair?

In recent years there has been a tendency toward increasing costs of repair work for ship owners and increasing time periods for repairing ships. The existing practice for evaluating the activity of ship repair enterprises does not encourage a reduction in production costs or a reduction of the time periods for ship repair work but, rather, on the contrary: today's system encourages an increase in expenditures, and frequently the plan is fulfilled as a result of costly equipment. Ship repair workers avoid capital repair of mechanisms and strive to replace them with new ones since their cost is included in the volume of work that is performed. When they have their own tugs and floating docks they try to lease them to outside organizations--the more floating equipment that is leased, the higher the cost of repair of the ship and the more easily the plan is fulfilled. And one finds real paradoxes: in practice the repaired ships stand idle at ship repair enterprises waiting for the following month, since the plan for the current month for commercial output has been fulfilled.

Transportation offices, shipyards and fishing ports, having grown to incredible sizes, apparently cannot fit into their former trousers--production enterprises for catching and processing fish: there exists an optimal amount of controllability. Though even this assertion is not unquestionable, the experience of the Murmanskaya Sudoverf Production Association under the

Sevryba VRPO jurisdiction refutes this conviction. One thing cannot be denied--all links in the chain of the fishing industry and their tasks should be subordinate to one final goal of the fishing industry--all-around satisfaction of the needs of the people for fish products. This is not yet the case.

The lack of balance of the capacities of the manufacturers of the products, the transportation fleet and the fishing ports as well as the lack of coordination of the indicators of their labor and the measure of their responsibility lead to an increase in fish products that are not shipped from the enterprises, and on Kamchatka this "increase" has become more active. Thus while in 1970 the canned goods remaining on ship at the end of the year in the USSR Ministry of the Fish Industry amounted to 6.5 percent of the annual volume of output, in Kamchatrytprom it was 13.9 percent; in 1983 for the ministry--9.6 percent, and for Kamchatrytprom--22.3 percent. Almost one-fourth of the products produced remained in the warehouses. In 1984 enterprises and ships of the association dispatched 31,000 tons of products that had been in storage one-third longer than the permissible time period, or 7 percent of the food products produced during the year, and 16 million conventional cans of preserves or 15 percent of the amount produced. A consequence of the delay in shipping fish products is the fact that the quality is lower than in the USSR Ministry of the Fish Industry as a whole and it is practically not improving. Under the 11th Five-Year Plan the idle time of the fleet while waiting to ship fish products from only one of the three bases of the association amounted to 2,012 ship hours, which in monetary terms (in output of commercial products) is equal to 91.6 million rubles or 50 percent of the base's annual plan.

A fairly significant factor that reduces the effectiveness of production is arrears in the development of a social sphere. And although the wages, one of the social indicators, increase annually in Kamchatka at more rapid rates than in the branch as a whole, it is also important to provide for housing, kindergartens, schools, and cultural institutions. With respect to these indicators Kamchatka Oblast is one of the last of the 86 oblasts of the Russian Federation. If one takes into account that the average age of a Kamchatka resident is 27.5 years, the need to develop the social infrastructure becomes even more obvious. But so far there is increased labor turnover here and, consequently, a constant influx of unskilled, poorly experienced workers. In 1984 24 percent of all the workers were released from enterprises of Kamchatrytprom. The majority gave as the reason for their leaving the lack of provision of housing and kindergartens.

But there are essential unsolved problems in wages as well. The main one is the payment for the labor of managers of enterprises of the fishing industry and the administrative staff.

A fishery on the coast of Kamchatka is the only industrial enterprise of the village. The fishery's subsidiary farm provides the entire village with groceries: the plant's port point receives and processes cargo for all enterprises; the plant boilers heat the plant and its workers, and also the

schools, hospitals, kindergartens and residents not directly employed by the plant. With a staff of plant workers of 300-400, it actually supports a village of 3,000-4,000 people.

Self-sacrificing people who love their native home work on the sandy shores washed by the waves. As for material remuneration for the extra long working days, this is the way it looks. The salary of a manager of a fish industry enterprises of Group VI is 135 rubles, and in the first, the highest group--315 rubles. The wages of the other workers of the plant administration are distributed proportionately. At the same time, the salary of a manager of, for example, an agricultural enterprise of Group VI is 240 rubles (that is, higher than for Group I of managers of the fish industry), and the agricultural manager of Group I receives 345 rubles. Wages for managers of enterprises of the Kamchatlef Association are significantly higher. It turns out that the leading branch of Kamchatka has the least well-paid managers. The work at enterprises of the fishing industry is hardly easier than it is in other branches. The conditions for life and daily activities are no better either. And the natural question arises: why are there such great differences in wages? Has the time not come to reduce this difference somehow? The more so since now when we have become official partners in the USSR Gosagroprom. Apparently one should also take into account the circumstance that some sources of increased earnings in the form of current bonuses are practically not offered to enterprises of Kamchatrybeprom. A large number of indicators for bonuses and basic and additional conditions nullify the entire system of incentives: fisheries and fish canneries along the coast of Kamchatka have received their quarterly bonus on an average of once during the past 3 years. Half of the enterprises (incidentally, the staff of the association as well) have not received any bonuses under the current bonus plan at all.

The documents of the 27th CPSU Congress made the fishing industry responsible for large tasks for producing food fish products and canned goods. What are the ways of carrying them out?

There is hardly any justification for counting on an essential increase in the oceanic bioresources. The dynamics of the world catch as a whole and for individual fishing regions in particular shows that we are gradually approaching a certain limit in the catch which is conditioned by the state of the biological supplies and the technical level of the means of fishing. Thus during the first postwar decade (1950-1960) the world catch almost doubled (a 1.9-fold increase) and during the next decade (the peak of ocean fishing) it increased 1.7-fold, but during the decade of 1970-1980 it increased only by 7.7 percent, and these rates of increase are continuing into the current decade.

The USSR's proportion of the world catch has stabilized during past years at the level of 12.4 percent. International conditions for industrial fishing do not make it possible to count on the idea that the limitations on expedition fishing will decrease and our share in the overall catch will increase. Nor is there any reason to assume that the assortment taken from the ocean raw material will improve with respect to its qualitative characteristics. Thus in 1960 herring, perch, cod, and plaice comprised half of the catch in the USSR Ministry of the Fish Industry; in 1983 they comprised 6.5 percent, and

50.5 percent was sprats, mintay and trachurus. In the raw material balance of the Kamchatkayiprom Association in 1966 perch, herring, and plaice comprised 58.4 percent of the volume, and in 1980—only 6.7 percent, while Mintay, small herring and trachurus comprise 13.7 percent. Nonetheless, with the existing quantity and assortment of bioresources it is necessary to produce more products and with consumer qualities that equal and perhaps even surpass those of the previous assortment. The task cannot be carried out with the present-day technology for processing fish and sea products. But if the technology does not correspond to the composition of the bioresources, it must be changed! We need new areas for the utilization of the ocean's resources which are capable of "enriching" existing raw material and giving it properties which will satisfy the consumer and at the same time extract the most possible food content from it.

The next task to be set for us by the documents of the 27th Party Congress is to raise the technical level of the means of production.

More than 9,000 units of new technological and energy equipment worth 34 million rubles, including 554 units of imported equipment, were introduced in the Kamchatkayiprom Association at enterprises and in the fleet during the years of the 11th Five-Year Plan. They introduced 63 comprehensive, mechanized and semi-automated lines, machines for sorting small fish and cleaning salmon heads, and comprehensive lines for processing salmon caviar. Technological lines were installed on the ships for producing cooked and frozen crab. Preserving lines were reconstructed on the floating bases and their capacities were increased to 300 tubs per day; lines were created for producing Kalmar-Naturalatty canned goods. All the floating bases were equipped with universal sections for producing cleaned mintay, mintay fish sticks, and cleaned herring and salmon. At practically all of the floating bases the manual wrapping machines were replaced by semiautomatic ones. Modernized equipment for producing fish oil was also installed on ships of the fleet. During the years of the 11th Five-Year Plan 12 million rubles were invested in modernizing the fleet.

Underwater equipment is used on fishing ships. This has increased the effectiveness of trawling and increased the capacity of the trawlers 1.6-fold. Fishermen of the association have successfully mastered the use of crab traps. A large amount of work is being done on ships of the fleet for modernization and replacement of complete fish prospecting, radio navigation and hydro-acoustic equipment, and instruments for satellite navigation, which saves a considerable amount of time when ships are being moved to fishing regions, and increases the safety of travel on the sea.

Work for technical reequipment and modernization of production capacities is also being done at coastal enterprises. All this has enabled the nation during 4 years of the 11th Five-Year Plan to increase the output of fish commodities by 39 percent and the output of canned goods by 28 percent; and it has also managed to introduce 49 new kinds of products into production. It is important that at the same time labor productivity increased by 39 percent and is ahead of the 4-year planned assignment by 15.4 percent. The coastal fishing enterprises have increased the output of commercial products by 74.3 percent and the output of canned goods by 45 percent, while the number of

industrial production personnel has increased by only 2.8 or by 4 percent, that is, practically all of the increase in output has been accomplished as a result of increasing labor productivity.

But when summing up these optimistic figures we are still well aware and understand that the salting and cleaning of salmon and herring on Kamchatka, the main production processes at coastal enterprises, are done by hand. This is probably what Corresponding Member of the USSR Academy of Sciences P. G. Rurich had in mind when he wrote that "essentially, the processing of fish is done by methods that were applied even before World War II while the nature of fishing and the composition of the catches have undergone significant changes." Only 8 percent of the workers employed in producing salted fish products use mechanisms in their work. But on the scale of the association 10,000 of the 17,000 workers perform manual operations. Intense social and economic reserves lie in the elimination of this anachronism.

One of the main indicators of scientific and technical progress is the updating of the active part of fixed capita. The 27th Party Congress gave a clear instruction regarding this: to accelerate the updating of the fishing fleet." The association has a large number of ships, machines and equipment that has been in operation for dozens of years, is worn out and is obsolete. In the fleet alone there are 77 ships that should be written off.

At enterprises of the association the percentage of updating of fixed capital is extremely small, especially with respect to working machines and equipment. During 4 years of the 11th Five-Year Plan only 3.7 percent of the active part of worn-out capital was eliminated, while the increase amounted to 31 percent, that is, there was practically no updating. Today there are more than 1,300 units of motor vehicles, construction equipment and other equipment, most of which has been in operation for 15-20 years. Because of the technical condition the coefficient of their utilization does not exceed 30-35 percent, and, after all, there is a worker working at each mechanism.

Another problem which requires a principally new solution is mechanization and automation of the output of products on ships of the fleet and their delivery to the consumer.

Today fish products from the ship (frozen, salted, canned and so forth) go along the route "manufacturer-consumer" with the following manual stages: packaging, placing in the hold of the manufacturing ship, transfer to the transportation ship out in the open sea, unloading from the transportation ship to the warehouse, loading from the warehouse to the railroad cars, from the railroad cars to the holds of river ships, unloading onto the river dock, delivery to the trade base and, finally, the final stage--delivery to the store.

It would be possible to eliminate at least two of these transfers (if, for example, the products were loaded from the transportation ship immediately onto the railroad cars, bypassing the river transportation). But there still remain seven. What kind of packaging can withstand this? Neither barrels nor corrugated metal containers, of course. And therefore thousands of complaints come from the places of consumption: the containers are dirty, rusty; the

salted fish is of poor quality.... Apparently the only containers which can withstand the voyage of thousands of miles and may still be returned are regular ship containers. But why not charge over the top?

There is already a prehistory of the mechanization of the ship. There are products: packaging of consolidated loads, packet slings, and other it is difficult to solve the problem. The logical culmination should obviously also be containerization of cargo transfers and, consequently, also means of transportation. The advantages of container shipments are obvious: manual labor is reduced in all stages, the amount of time required to deliver the products to the consumer decreases, quality improves, and other expenditures decrease because containers for one-time use are eliminated.

The course toward the assimilation of the bioresources of the oceans is necessary and inevitable. But it must be embodied with minimum expenditures and this means accelerated elimination of all bottlenecks. The development of the coastline should proceed in parallel to this course.

We have refrained from producing large freezing trawlers which up to this point have been profitable in spite of the fact that they are 20 years old. We have changed over to "super trawlers" which began to be used at a time immediately after they were originated. This is because the "labor price" of the new trawlers is much greater than their production capabilities or the increase in labor productivity. It is also because there is no significant area for their operation. Perhaps the time has come to revise our position and go back to the simple RFT's and RTM's without adding the "super". These have already cost us enough.

Practically the entire period of the development of Far Eastern fishing industry is accompanied by large amounts of idle time of fishing and production vessels because of the shortage of means of transportation and the poor handling capacities of the fishing ports. By eliminating these losses alone we would increase the effectiveness of the fleet's work by 20-30 percent. Perhaps this argument should also be the main one when determining the paths of development of the fishing industry for the 11th Five-Year Plan. The development of all lines, roads and hydrotechnical installations in the future will be inevitable. But this problem, because of its immensity and the many millions of rubles' worth of capital investments, is a task for more than one five-year plan. But shipping the final products from the warehouses of the coastal enterprises is a concern of the present day.

In 1985 the association in conjunction with the steamship line conducted an experiment on the utilization of lighter shipments to supply coastal enterprises and ship canned goods. We shipped 27,500 tons of cargo according to this plan. The economic advantage was obvious. Perhaps we should check over from an experiment to practice and turn over the lighter Aleksiev Kosyulin for the fish industry of the Far East to rent for the summer period?

There were a dozen and a half comprehensive target programs (KTP) in effect in the fishing industry in effect in the fishing industry under the 11th Five-Year Plan. There were probably justifications for introducing them, but precisely this number. And, probably, there is some effect.

application. But judging from the KTSP Losov, the effect turned out to be much less than was expected. Perhaps the time has come to revise them and reduce them somewhat so that more attention will be devoted to the remaining KTSP's and they will actually become the main unit in the development of the fishing industry.

Since January 1986 the fishing industry has been operating under new management conditions. A great deal is expected from this important step. And the main thing the managers of fish industry enterprises are counting on is the creation of conditions for high-quality, highly productive labor, initiative, enterprising and acceleration of scientific and technical progress. Then the aforementioned contradictions will be eliminated and the fish industry will proceed confidently along the path of intensification.

#### FOOTNOTES

1. Evaluating the situation objectively we note that the tendency for Soviet fishing to shift to the Pacific Ocean was observed even before the introduction of the international conditions, but it was also accompanied by an increase in the proportion of the catch in the Atlantic Ocean. Thus from 1960 through 1976 the average annual increase in the proportion of Soviet fishing in the Pacific Ocean amounted to 1.9 percent, and in the Atlantic Ocean--0.4 percent, which should be regarded as a kind of planned equalization of the loads over various fishing regions. But during the past 7 years (1977-1983) the catch in the Atlantic Ocean began to decrease sharply, by an average of 2.3 percent per year, and in the Pacific Ocean it continued to grow, with average annual rates of 1.2 percent.
2. "Efficient Exploitation of the Food Resources of the Seas and Oceans," VESTNIK AKADEMII NAUK SSSR, No 2, 1968.
3. Moiseyev, P. A., "Biologicheskiye resursy Mirovogo okeana" [Biological Resources of the World Ocean], Moscow, "Pishchevaya promyshlennost", 1969, p 22.
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6. "Activating the Human Factor" (from the 6th General Fleet Party Conference of the Rybkhodflot Base), KAMCHATSKAYA PRAVDA, 10 November 1985.
7. "Okean. Ekonomicheskiy problemy osvoyeniya" [The Ocean. Economic Problems of Assimilation], ed. by P. G. Bunich, Moscow, "Ekonomika", 1975, p 106.

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CSO: 1820/199

## PRODUCT QUALITY CONTROL SYSTEM DESCRIBED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 69-83

[Article by Yu. D. Popov, engineer (Perm): "The Quality of the System of Quality"]

[Text] In terms of the level of their quality items with the Soviet trademark should be on a par with world achievements, as was emphasized in the Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up the Year 2000. But so far we cannot say that our product quality satisfies us. In this connection a great deal of interest is evoked by the system of product quality control (KS UKP). At one time many hopes were placed in this system. It was discussed extensively in the press, including in EKO. But time has passed and many hopes have continued to be only hopes. The system has not made any radical improvements in product quality, which we still need. This is discussed in an article published on the pages of the magazine. Possibly certain of the authors' assertions will seem questionable to you. We will be glad to offer space in the magazine for opponents.

### The Quality of Work or the Quality of Products?

A comprehensive system of control of quality of work (KSUKR), which was developed at enterprises in the country in 1974-1980, has entered the period of operation. Reports on its introduction and successful operation have been submitted by the majority of large production associations. Enterprises are reporting significant sums of economic effectiveness from measures introduced within the framework of the KSUKR and are certifying products for the State Emblem of Quality.

The origination of the KSUKP in our industry was conditioned primarily by the insistent need for a large quantity of powerful and precise mechanisms that would operate reliably under the most extreme conditions, in various environments and with maximum speeds. The task that was set could be carried

at only with the most modern technological processes, high quality of technical processing, and the application of new materials, original designs and ergonomic solutions. Comprehensive control and regulation of all of these factors were also to be provided with the help of systems for controlling product quality.

This also presupposed that for all of the items produced, for all of the components of which they consist, and also individual important parts comparative quality indicators would be developed which could characterize the distinguishing features of the purpose of the item, the technological level of its manufacture, the reliability and durability, the ergonomic peculiarities, the possibilities of obtaining patents and competing successfully, and a number of other parameters. The overall number of indicators was 8-11. It was intended to establish a given level of quality of a particular item (either with respect to an analogue or with respect to the convention base item) and then regulate it in all stages of production. The evaluation of the quality of labor, the insurance of the technical level of production, the training of personnel, the social development of the collective and other factors would be taken into account as indirect constituents which influence the quality of the products that are produced and were to be singled out into auxiliary subsystems that form the regulating complex.

The methods for introducing the system which were applied at enterprises during 1976-1979 led to a situation in which this program remained unfulfilled. The main ones who were "not up to it" were the USSR State Committee for Standards and a member of head institutes which were not able to take charge of the development of the system, by promptly providing certain guidelines and fundamental documents for this.

An indirect mention of the system appeared in GOST V2.57.101-76, "Comprehensive System for Quality Control (KSKK). General Provisions" at the end of 1977. The subject matter that was developed suggested that the base enterprises began to produce OST's for technical control of items, taking into account the "specific features of production," that is, for parts for the automobile--one OST, for a bicycle--another, and so forth. Many OST's were produced and approved, and the lack of substantiation for the basic idea of the KSKK was immediately discovered. Thus in shops that bore pipes there were three OST's in effect at the same time for various equipment. Naturally, they were distinguished by various requirements on the equipment, location and technological process, and sometimes they were incompatible. This system which could not exist either in theory or practice, according to the assertion of the GOST, was to be included in some KSUKP (?) and was a subsystem of it. The developers obviously understood the weakness of the position that had been taken and this project was halted. But the unnecessary, but already published OST's have not yet been abolished. The plant developers knew what the KSUKP only from scientific literature and from papers at the corresponding seminars since many enterprises had already begun to introduce a system based on the general principles of management. Not until 1981 did GOST 24.525.2-80 "KSUKP. General Provisions" come out. But the most paradoxical thing is that it did not extend to all kinds of products. One cannot reproach the State Committee for failing to understand the prompt publication of these documents. As early as 1975 20 standard plans for plant standard productions (STP's) were

published for the corresponding number of tasks included in the overall range of problems that were to be resolved by the system.

The selection of these tasks was somewhat arbitrary, but at that time nobody was bothered since it was intended to publish the entire volume of tasks carried out through the KSUKP. Nonetheless, because of the lack of GOST's, the selection left its imprint both on the intraplant developments and on the designs of systems created by branch institutes. They accidentally or intentionally had mainly to do with questions of quality of labor and, in spite of the lack of legislative force, gave the developments the corresponding direction. Thus the Lvov, Minsk and Riga systems, which lay at the basis of modern developments, proceeded along the line of encouraging improvement of the quality of labor (work) and not control (regulation) of the given level of product quality.

The KSUKP was introduced into the KSUKR as a subsystem in the majority of departmental plans, but there was no hint of any establishment of a given level of quality in specially developed indicators for controlling product quality. Here it is appropriate to recall that the given level of product quality is a concept that actually exists and is regulated by the "card for technical level of quality" which is filled out when submitting technical documentation for conferring the State Emblem of Quality. The fact that the card does not envision the existence of all 8-11 indicators is its essential shortcoming. These concepts also figure in the aforementioned GOST 24.525.2-80 where it says directly that control over indicators of product quality should be provided in all stages of an item's development and production.

Thus a contradiction was created between the requirements of the theory, and also the GOST's, on the one hand, and the actually introduced plans for the comprehensive system, on the other. The situation was exacerbated also by the fact that the KSUKR's were developed by enterprises on the basis of the Saratov system of BIP (defect-free manufacture of products) and, naturally, retained as the main principle of the approach to quality control the release of the products with the first presentation (when grading the workers), which would have characterized the quality of the work of the workers. We are not setting as our goal to criticize the BIP. Yet it should be emphasized that the KSUKR, having expanded the range of effect of the old method but not having rejected regulation "of the given level of product quality" in terms of the aforementioned indicators, deprived itself of the possibility of efficiently controlling the quality of the item.

In and of itself regulation of a given level of product quality has meaning only with the most rapid possible reaction to the disagreements that arise. Then the system wards off either the appearance of mass defects or a sharp increase in production costs. But there is not a single paragraph of legislation that stipulates that the KSUKR must have efficient control. All the controlling decisions are made at so-called "Days of Quality." The time intervals between them range from a week to a quarter.

But of course the KSUKR could not do without quality indicators. Therefore a solution was found fairly simply--a group of indicators that characterize the quality of the manufacture of the item was arbitrarily called "indicators of

product quality" and introduced into the KSUKR. Sometimes the last word is omitted and we are dealing simply with "quality indicators." Sometimes the KSUKP subsystem openly controls indicators of the quality of work, as can be seen from the example of the engine construction plant imeni Ya. M. Sverdlov (Perm). For production and auxiliary shops, for example, these include the rhythm, level of technological discipline, and so forth.

There are only two direct quality indicators: the indicator of complaints of production and technological shortcomings and of design imperfections.

The main indicators of the work of the shops for control of product quality are considered by the UKP division to be: the number of cards for permission for deviations from technical documentation and the number of parts passed in deviation from the KTV; the number of intershop returns; and the proportion of parts and assemblies with the Emblem of Quality.

Yet in the KSUKR there is a special subsystem of defect-free labor (SBT) which includes control of the majority of the coefficients just listed. In many KSUKR's because of this there is also a list of functions of SBT for the subsystem UKP.

In our opinion, no small negative role was played by the generally accepted formulation of the concept quality which is current in our technical literature. For some reason quality has come to be called the "totality of certain indicators that determine the purpose of the item...." In this definition there are other additions which essentially clarify nothing. Thus quality is the totality of only those indicators which distinguish one item from another item in the same list, that is, a tractor from a tractor or a spade from a spade. And the indicators of quality lie not in the fact that the tractor pulls or the spade digs, but in the fact that one tractor has a greater engine life and the other has a shorter one, or the dirt sticks to one spade and to the other it does not. The generally accepted definition in no way limits the list of the "totality of indicators" thus not singling out decisive, specific indicators. Nor does it contain a comparative approach for determining quality.

How have these contradictions been reflected in the operation of the KSUKR?

First and foremost this has led to a refusal to introduce indicators of reliability and durability of items, technological level, continuity of design and degree of standardization, ergonomic qualities, the ability to obtain patents and compete, the ability to be repaired, operational profitability or the real level of allowable defects in individual components and the item as a whole. The term "degree of defects" is understood as correctable defects which are differentiated according to "causes" and are taking into account in terms of the degree of influence on the item's ability to operate when determining the quality of this part. This has deprived the KSUKR of the possibility of guaranteeing the required level of quality of the item and has led to the creation of specialized services for warranty supervision!

The application of indicators of the quality of labor both in terms of the purpose and along with indicators of product quality lead to a departure from

immediate control even in the event of such a deviation from technical documentation whereby a card permitting the deviation is filled out. There are cases in which the deviations are discovered after the final inspection and not during the course of the process of manufacture. Such an item cannot be refused to be put on the list for issuing a card permitting deviations from technical documentation. There is no longer any need to intervene during the course of the technological process, which in practice has been legitimized in all plans for KSUKR known to the author. The exception is flow line and mass production, where statistical control is used, when adjusting automated equipment or a book of remarks is used as at the Izhevsk Motor Vehicle Plant. The registration of this kind of deviations is done periodically and the management decision is made either by the PDKK or on the shop and plant Day of Quality, and in extreme cases by the administration, without any system at all. The time period for settling this is from 2 weeks to 3 months. Prevention of defective work is handled not by the KSUKP but, as was previously the case, by the technical control division.

A service for quality control, that is, the executive agency of the KSUKR, is missing at the majority of enterprises. The structure of the service has not been developed, and its ties, subordination, and sphere and mechanism of effect have not been stipulated either in the draft of the Lvov system or in the drafts of Minsk, Riga or Krasnodar. Today these services have been replaced everywhere by groups of three-four people created for developing the KSUKR. But since the stage of the creation of standards for the enterprise has been completed almost everywhere, these groups engage in adjusting the documentation that has been produced and prepare for the development of STP's of the second edition of the system, the so-called KSUKR-II. In places where they engage in the collection and processing of coefficients of quality of labor that come in from the shop authorities they sometimes are given the names of subdivisions for quality control, although they do not exercise control over actions. If these services actually do try to control quality, they encounter not only a lack of an object of regulation, that is, a "given level of quality," but also a lack of methods for gathering operational information, information software, an established policy for issuing control decisions, influence and feedback, that is, they simply do not know what they are doing.

The so-called coordination of the work of the KSUKR frequently amounts to issuing an order to write an STP, and then collecting signatures for its approval. The impossibility of arranging comprehensive control over the introduction of standards leads to a constant violation of them. This is revealed episodically, but frequently goes unpunished. The most typical violations of the STP at the enterprises are postponed control actions, violations of document circulation, exceeding authority, and failure to punish the people to blame for the fact that products are returned. In practice the activity of these enterprises has been reduced to duties similar to the functions of standardization divisions. The only difference is that some control the introduction of GOST's and others--STP's. In certain cases this procedure amounts simply to submitting information.

In the middle of the 1970's at certain machine building plants there was operational control at the level of product quality on intershop equipment.

wards. As of today, as a result of adjusting the STP's in keeping with the plans for KEDO, this no longer exists and has been transformed into control of performance. Planning coefficients of the quality of labor is done by the method of "from the level achieved," since there can be no technically substantiated calculation of this with the exception of the degree of rhythmic work. As certain production associations the average planning coefficient of the release of products with the first presentation is 96 percent. The release according to the report is up to 99 percent. But this is with 300-400 inspections each quarter and small-series production!

The coefficient of the number of violations of technological disciplines is intricated quite arbitrarily. It is assumed that if one takes a certain percentage for inspection (25 percent of the technological operations from the overall number started up) then the percentage of violations will give a precise picture of the condition of technological discipline. But in this reality this percentage will depend on the level and quality of the inspections. Thus according to our statistics for many years, the percentage of violation of technological discipline registered according to the shop schedule ranges from 1 to 4 percent. According to the documents of spot checking it ranges from 5 to 12 percent. According to the documents of cross-checking and various commissions this figure reaches 20 percent and more. But these data, as a rule, are not taking into account when calculating the coefficients reported by the head technologist's service. The average percentage of violation of technological discipline for enterprises of Turia is in the range of 1.5-2.5. This is approximately one-half to one-third the actual amount discovered.

For the majority of the aforementioned constituent coefficients, at enterprises of the branch a comprehensive coefficient of labor quality is being established both for individual workers and for the collective. Bonuses are calculated from it. Here one also considers several principal interrelated factors. According to the policy for defect-free release of products with the first presentation, in order to encourage quality sorting of items by the worker, he does not have to pay the sum of expenditures for defects he discovers himself. At the same time, in the comprehensive coefficient of the quality of labor, at the majority of production associations, the fulfillment of the norm has been introduced as a constituent parameter or a mandatory condition for awarding bonuses. Thus, on the one hand, for defects revealed without the participation of the technical control (i.e., there would be no penalty but, on the other hand, in spite of high-quality products that are released, the coefficient of quality is low since the quantity has not been released! The bonus for quality is reduced correspondingly!

Let us take the opposite situation where the norm has been fulfilled but there are returns and therefore the coefficient of labor quality has been reduced. It is sufficient for the worker to obtain any elevating coefficient (for an efficiency proposal, for example) and the total coefficient of labor and performance ( $K_{K+P}$ ) will make it possible to obtain earnings and a 100 percent bonus. As a result, in any case there is reason to try to cover up defective work.

the question of registering "returns" remains problematic. Even the bonuses of the controller do not depend on the fulfillment of the plan by the shop (it depends completely on the fulfillment of the general plant plan) the second presentation is filled out, as a rule, only because of a final rejection. The so-called corrected defect is registered only rarely. Payment for high-quality labor of engineering and technical personnel is also insufficiently substantiated and far from always coordinated with the actual work in which the engineer is engaged. For example, a low coefficient of supply of equipment in the shop does not affect the  $K_{opt}$  of the technology. As a result there have been cases in which shops when machine tools are readjusted five to six times a shift have not introduced the group method of processing parts! The design imperfections are not taken into account everywhere when calculating the  $K_{opt}$  for designers.

To this point there have been no additions to the instructions for the designs of KSLPR's which would establish their interrelations with the brigade form of labor organization. How will the work of the technical control division be arranged with the brigade contract? Individual enterprises are trying to introduce technical control of independent brigades by controllers. There are also other opinions--concerning the need to introduce their own controllers into the brigade or a controller who is assigned to the brigade. Not one of the known plans for KSUKR envisions this policy. Yet the application of the KSUKR with the brigade form of labor organization is of great interest. The brigade, being responsible for the final result, can easily independently regulate the given level of quality of the product it produces. And on the other hand there is no longer a need to control the quality of labor of an individual worker. In fact, what kind of second presentation can there be if the brigade has guaranteed the quality? And if defects are still discovered, these are defects of the entire brigade. As of today, attempts to reduce the capital  $K_{opt}$  of the brigade to the lowest  $K_{opt}$  of its member, as has been practiced in certain plants, makes no sense at all.

Because of a whole number of measures that encourage the quality of labor, the enterprises have not yet withdrawn the slogan that calls for improving the quality of the products that have been produced! It turns out that, on the one hand, we are establishing the optimally advantageous calculated level of quality within the framework of the KSLPR and at the same time we are asked to increase it to what is not optimal, that is, to violate it. Understandably, with the brigade *as that* all these appeals will look like empty talk but it is time for "improvement of quality" to become the duty of the shop worker. Regarding this one repeatedly hears the question: "how is the worker to improve quality? Make the tolerances stricter or something?" It seems unrealistic to require that returns of poor-quality products from the customers be eliminated. It is another matter to reduce the number of traps.

All systems introduced in production associations envision application for computer software. This in keeping with one of the plans for 1982-1 the machine is given data for solving almost 100 individual problems, the majority of which have nothing directly to do with the quality of products that are produced, and the printouts are either a means of providing information for bookkeeping or, at best, they summarize the coefficient of the quality of labor, losses from defective work, and other economic indicators. In the task

of accounting for and analyzing, detects they have not introduced such requisites as the number of the part or the number of the reason for the defect itself. In this form the printout is hardly suitable for bookkeeping. It is quite unsuitable for any kind of analysis whatsoever. Under these conditions the enterprises introduced only one-tenth of the entire list. But even in the tasks that were introduced, they did not manage to get rid of shortcomings since they did not envision operational quality control. They did not reliably accomplish the composition and sources of information, the systems for document turnover, or the technological systems for processing information. The situation described is already being repeated--the computers issue printouts periodically and promptly, but decisions are made from them after a time period of from 3 days to 3 months. (The day of quality for the plant director is once a quarter and it does not always have anything to do with questions of quality.) Since 1980 the documents from inspecting the functioning of the KSUR and at enterprises of KEM have noted several cases where the printouts for the aforementioned problems were not used at all.

It seems that loading complicated and costly computer equipment with such tasks is unprofitable today. Even if one considers the current situation as a training process. The more so since the information that goes into the machine is not reliable. It is not an accident at all that the data from the printouts regarding quality are not used when calculating the effectiveness of the KSUR (with the exception of the graphs of "losses from defects" and "fines").

#### Are Methodological Developments Improving?

The unsatisfactory work of the KSUR, which is recognized in one way or another at the enterprises, causes them to continue to develop new plans and to improve the system. In 1982 in KEM a standard plan for the KSUR-II was published. According to it certain enterprises conducted their own developments. Which of the advantages from the experience in working with the KSUR-I were taken into account in the new plans? First and foremost, obviously, the range of the system did not seem broad enough. In spite of the introduction into it of individual subsystems of defect-free labor and the KSURP, as was done everywhere, the plan initially envisioned the output of standards for 12 other subsystems. Each of them was to be represented by several standards that regulate the normal course of the activity of the subdivision, not at all from the standpoint of the SBT or the provision of the given level of labor quality, but from the standpoint of the ordinary working process. All these divisions regulated ordinary production processes. The subsystems SBT and KSURP remained in the KSUR-II without any serious changes as did also the entire policy for removal and inclusion.

The difference in the plans consists mainly in the quantity and names of the newly introduced subsystems. Thus one of the Frunze machine-building plants introduced 18 subsystems into the plan while one of the Tula machine-building plants reduced the number to nine, having combined several of them. These were control of scientific and technical progress; control of the production process; control of product quality (1); control of material resources; control of labor resources; control of technical and economic planning and financial resources; control of fixed capital and capital investment; control

of the social development of the collective (separately the technical progress and scientific organization of labor); and the system of defect-free labor.

The composition of each of the subsystems in the aforementioned plan make it possible to draw the conclusion that within the framework of KUKR-II the enterprises can develop and introduce a system of production control. With this content of the plan it includes a position for describing the role of the quality control service. It is not known how it will appear in the new composition and what will be done in various stages (in the stage of development, for example). The mechanism for control of the new system and the structure of the control agencies are not clear either.

The shortcomings of the KUKR, which are included during development and manifested during operation of the system, were the reason for the skeptical attitude toward it on the part of the management of production associations. The majority of directors do not use the KUKR as a lever for control and have preferred to entrust the control of this imperfect mechanism to their deputies. But there are other examples as well. At certain enterprises they have suggested effective solutions for completing the systems of quality control and are obtaining a real return from them.

The difficulties that were created during the operation of the KUKR not only seriously discredited the system itself at its current level, but also created some kind of illusory atmosphere of self-deceit and complacency. They say the system of breaking in has come to an end and everything is in its place. This is a delusion. From the example of the system of defect-free manufacture of products it is clear that after 20 years of improvement we are still not efficiently controlling product quality. There can only be one way out of the existing situation--to recognize that the matter consists not in objective conditions, but in poor organizational development of directive technical documentation for the control system. Among the primary measures directed toward bringing the quality control system into working condition, one must extend the GOST 24.525.2-80 to the KUKP's for all kinds of production.

The new tasks that ensue from the application of improved systems for controlling production and quality at enterprises and the introduction of the brigade contract will obviously also require a significant rearrangement of the structure of control of the enterprise and changes in communications, document circulation and the entire mechanism for management. All of this restructuring should be done on the basis of a unified GOST.

Regardless of whether or not methods for controlling product quality according to indicators are developed in the GOST, the enterprises must calculate the total coefficients for the establishment of the minimum permissible level of quality of the most important parts and components. They must develop a structure for the system of operational tracing of deviations from the level set using the help of these coefficients. The calculation of the degree of deviation from the given parameters should be done on an electronic computer with the corresponding programs, and the printouts should be problem only in the event of a negative coordination. The control influences are admitted to the executive unit only at the corresponding level of management.

It is quite obvious that the bonus for "quality of products that are produced" should be paid only when these requirements are met. For failure to fulfill the norm it is quite sufficiently to reduce the payment of whatever bonus is provided for, and other penalties are not permissible since the worker himself has reported his own defects.

The quality control service should, in our opinion, be under the operational jurisdiction of the manager of the enterprise since as of today his deputies do not have the appropriate authority. The service's composition should depend on the selected method of checking on the level of quality and the system of information support (degree of their automation).

As a particular task which today determines the activity of subdivisions introducing the KSUR it is necessary to put forth the coordination of work for correcting the standards of the enterprise that envision the introduction of a system of defect-free labor. This should include the development of an SIP, "provisions concerning the service for control of quality of work"; the authority for the SET; the calculation of the Kkti, and also the adjustment of bonus provisions. These subdivisions should be responsible for control and authors' supervision of the introduction of standards for the KSUR and organize mandatory accounting for the system by the manager of the enterprise.

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ISSN: 1620/199

## INDUSTRIAL CERTIFICATION OF PRODUCTS DISCUSSED

Novosibirsk EKONOMIKA I ORGANIZATSIIA POMISHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 84-87

[Article by V. R. Isakov, head designer of the Propeller Shaft Plant (Grodno): "New Policy—Old Results"]

[Text] On 1 July 1984 the country established a new policy for certification of industrial products. Instead of three quality categories, two were introduced. It was intended to recertify all products up until January 1986, and uncertified products were to be removed from production. The categorical point that says that uncertified products should be removed from production within a month contradicts the planned system of industrial production since all products produced by industrial enterprises are planned and coordinated with deliveries for sets or deliveries of spare parts. Consequently, removing any product from production without replacing them is generally unthinkable. This requirement in this case is not coordinated with the mandatory 100 percent deliveries, the fulfillment of the plan with respect to the products list and the volume, with the time for preparing for production of the new item, the provision of work and wages for the workers, and so forth. This pertains especially to narrowly specialized enterprises with series and mass production of products of a single type.

Moreover, and the magazine has already written about this, it is necessary to overcome a large number of obstacles in order to obtain evidence of certification of products in the highest or first-quality category that is registered in agencies of the USSR Gosstandart and signed.

And another thing. The many years of experience in direct participation in the preparation for and conducting of certification of industrial products shows that the planning system for distribution of equipment, materials and batching items sometimes nullifies the result of the efforts of the enterprise for introducing the achievements of technical progress into production and for raising the technical level of the items.

Let us take as an example the certification of universal shafts to be in the highest quality category. Before each certification the technical services of the shops develop measures which, as a rule, are directed toward providing for stable quality of the items, that is, obtaining parts that meet the

development of the quality level of production. These measures are aimed at the efficiency of the various suboperations of the plant. As the new plant is designed and constructed, the quality level, refining and controlling processes, quality of basic of specifications, fill out information of the quality of the plant. The plant should be the core for the creation of a plant of technological innovation, and provide a more effective the position of a technological innovation and edge quality materials. It is necessary to lay out the cost of the attention of the process of preparing materials for certification is directed to the quality of the products and not limited to the cost of production of the technological process.

3. Improvement of the technological process through the application of modern equipment and fixtures as well as cutting and manufacturing methods is being carried out constantly and is directed to a greater efficiency of the requirements for increasing labor productivity, reducing production costs and providing for the necessary parameters of the item that is assigned to the required product quality. And it can be no other. The plant is operating according to a representation of the head enterprise that solves the current day and its necessary first and foremost to produce products strictly in accordance with these norms. In order to attain the necessary information on the use of availability of the external structure of the vehicles and is in operation from 10 to 12 years. And it turns out that the other information is not available about the production activity of the plant. It is not known what is the cost of the items are certified according to standards, but without the 100% certification.

4. The organization of a plant with an efficient or increasing the quality of the products that are produced than an effective labor action to create the quality of the items. The cost of these items and it would be necessary to significantly change the technological process for manufacturing the new items. This would require a considerable amount of material expenditures and time. The formation of products in accordance with developed and coordinated technological documentation. Furthermore, one of the decision rule by the state organization association, the head of the plant for the national economy would not be produced.

5. The creation of high quality products. This is the main and the main developed a technological basis for the high quality products. This cannot affect the technological innovation and the use of technological innovation and the introduction of which products are required to increase its service life. The main operating function of the plant for the cost of expenditures on the basis of its production.

6. The protection of the plant from the risks for producing high-quality products. Either the results of the positive incentives incentives for the protection of the plant. The problem presented by a lack of incentives for the protection of the plant. It is clear that there is only one right for the protection of the plant, and it is:

7. The following the norms and the rules of requirements for the quality of the products to the plant of the plant and the ministry, and

short-term and incisive strategic, and operational. Moreover the basic responsibility of the CTK lies with the quality control department (OTK) and the main concern is to work directly, or, better under the jurisdiction of the administration, but not through possibility of influencing the performance of the quality of work items at the highest category. Thus an internal signature with the CTK actually correspond to the highest quality category since it is a quality guarantee of selective product. All this increases the status of quality, which contributes to technical process at the highest quality level. It is indicated when the values of  $z_1$  to  $z_5$  in the chart, adequately planned, the enterprise is certified, which will be at the same time give out the seal of which is to each and individual in three major requirements are fulfilled by all rules which they are imposed on it. As a result, the appearance of the highest quality in the goods is guaranteed that it was manufactured there. It is right with the requirement of the technical documentation.

In order for the system for certification of quality of products to be fully cover for scientific and technical progress of the nation, certain changes are needed.

Notes. The requirements for  $z_1$  to  $z_5$  to be met should be met after sharply in their basic technical parameters and consumer qualities. The enterprise is prepared to produce items of the highest quality category, to submit an announcement to the local agency of the Ministry for it to issue a certificate of the right to produce them. The Government Agency can decide to refuse such a certificate or send to the appropriate relevant state commission to consider the application. The validity of the certificate is effective for 3-5 years. And after which period it is permitted to produce items of the highest quality category in the production for five years.

Items of the highest quality category can be sold only with the consent of the consumer, to whom they are delivered according to the agreement, there are no consumers for the item in the highest quality category, the enterprise can produce these items with the exception of the highest, but at the price of the first category with an additional payment of 10 percent of the difference between the price of the highest and first categories into the enterprise's fund at the expense of the consumer organization. When there are purchases of the item of the highest quality category, the entire difference between the cost of the highest and first categories goes into the enterprise's fund for the purpose of the organization for additional expenditures.

The right to produce items of the highest quality category should be given by the consumer after a practical demonstration. The real guarantee of the items of the highest category is to be in the form of a certificate of the organization. The acquisition of a certificate of the highest quality, and production should be performed in a factory that produces the highest quality category.

standard. A mandatory condition for providing for and guaranteeing the output of items of the highest quality category, in our opinion, should be their receipt by individuals not under the jurisdiction of the enterprise's administration. They should be representatives of the Gosstandart. To do this it will be necessary to transfer part of the OTK staff of the enterprises to the Gosstandart and its branches and laboratories. The Gosstandart should become an agency that supervises the fulfillment of requirements for quality in all stages and in all branches of public production. Subsequently control over the quality of products in the first category should be transferred to Gosstandart agencies. Thus the functions of the Gosstandart should extend to the development and publication of standards, guidelines and documents and control over the quality of technical documentation and items as well as the observance of the basic technological requirements in production and the determination of the quality of the prepared items.

In the proposed system the delivery of batching items of the highest quality category or items with the Emblem of Quality is taken for granted. This means that a universal shaft cannot be in the highest quality category if the bearings installed in it are in the first category. The same thing applies to a motor vehicle or any other item. An item that does not have the required quantity of batching items with the Emblem of Quality should not be marked as such. But even if it does have the necessary quantity of batching items of the highest quantity category, the item should be inspected, tried out and tested in sufficient volumes so that the consumer will have no complaints about it during operation.

The proposed system will be able to work only if the consumer will pay the manufacturer for quality. And if poor quality products have been manufactured, the manufacturer will pay double fine, that is, double the difference between the prices of the highest and first categories, to the consumer and will eliminate the defect at his own expense. Only this way, by thinking for the consumer and not for production for the sake of fulfillment of the plan will it be possible in industry gradually to solve the problem of improving product quality and to make a significant contribution to accelerating scientific and technical progress in the national economy.

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## FACTORS IN PRODUCT QUALITY INVESTIGATED

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 89-99

[Article by F. I. Palitsyn, candidate of technical sciences, A. F. Bedovyy, engineer-economist, and M. M. Pimonenko, candidate of physics and mathematical sciences (Leningrad): "Factors Influencing Product Quality"]

[Text] The Main Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up the Year 2000 said that it is necessary to consider it a matter of primary importance to radically improve the quality of products and services that are rendered as a most important factor in the intensification of the economy and fuller satisfaction of the growing needs of the national economy and the population.

We are assuming that an analysis and elimination of the main factors that impede improvement of product quality should be conducted on the basis of a systematic comprehensive approach.

A situation has arisen in which it is disadvantageous for the manufacturing plants to assimilate and produce new, better-quality products. It has repeatedly been pointed out in the press that the assimilation of a new item requires a great deal of trouble and material and labor expenditures, but the plan is firm and uncompromising. Moreover, naturally, for many months the enterprise can be deprived of its customary bonus and other benefits and privileges. At the same time the price of the new item and the system of compensation for expenditures and losses do not provide any advantages for the enterprise that has taken on the work of assimilating new products. The system of planning plays no small role in the situation that has been created. Indicators of the quality of products that are produced, in particular, are severed from the quantitative indicators and are not accompanied by the corresponding responsibility.

On the other hand, the manufacturing plant is weakly linked to the consumer--it does not know whether its products have been sold, whether they are being stored in the warehouses or have been marked down and salvaged--and all this concerns the manufacturer very little. If no complaints come in it means that everything is all right.

In the literature they consider and suggest various variants of indicators of product quality which should be planned. These suggestions can be combined into several groups.

To establish for each item one most important indicator of quality and plan its quantitative value (for example, "Miles on Tires").

To plan a number of quality indicators that characterize each item;

To plan a number of generalized indicators of quality for a set of products of the same kind or of different kinds. For example, "proportion of items causing complaints among those delivered" or "proportion of products of the highest quality category in the volume of products certified," and so forth.

To plan the comprehensive qualitative-quantitative indicator (production of the quantity of items on the basis of the indicator of quality).

Each of these methods suffers from particular although not always obvious shortcomings.

If one proceeds from the idea that in our country there is a system of state certification of products, based on this it would be possible to suggest the following group of indicators for planning at industrial enterprises that take product quality into account in one way or another.

The volume of production of products in value terms and physical units (pieces, meters, tons and so forth) for each products list. Units of measurement should be those which are applied in the sphere of consumption of the product.

The entire volume of output of the product should be distributed over products of the highest quality category (VKK), the first quality category, those that do not meet modern requirements and those that are being modernized in order to bring them up to the highest (first) quality category as well as those that are obsolete and have been removed from production.

The normative for increasing the wage fund in this case should be differentiated according to a progressive scale depending on the growth of the volume of products in each of the aforementioned groups. The products should be planned and labor productivity evaluated according to these groups. But in order for the aforementioned indicators, which reflect product quality and certification based on it, to actually contribute to increasing the output of high-quality products, it is necessary to provide for objectivity and reliability of the certification itself.

Of a number of existing shortcomings that reduce the effectiveness of certification of products as a mechanism directed toward improving quality and updating the assortment, let us consider only two:

the lack of strict, well-formulated and easily controlled criteria for including certified items in quality categories and a clear-cut system of evaluating the level of their quality;

the lack of strictly regulated responsibility of members of the certification commissions for the results of their certification.

Because of these and other shortcomings a considerable proportion of the products which have been awarded the state Emblem of Quality actually do not meet the requirements placed on products of the highest quality category. Let us recall three basic requirements:

surpassing or corresponding to the best domestic and foreign achievements in terms of the indicators of technical level and quality;

providing for a significant increase in labor productivity;

being able to compete on the foreign market.

These shortcomings lead not only to an unjustified increase in the rating (conferring of the Emblem of Quality), but also simply to curious cases. Thus, for example, residents and guests of Leningrad, Moscow and other cities are surprised to see on the streets manhole covers on which are cast the number of the technical specifications and a depiction of the state Emblem of Quality (unfortunately, the quality of the castings do not make it possible to read the number of the technical specifications). The ballpoint pen produced by the Soyuz PO (costing 35-40 kopecks) also has the state Emblem of Quality, but it is difficult to see the depiction of it with the naked eye. If one adds that these pens frequently do not work or the ink comes up only with certain efforts, one cannot understand what the state Emblem of Quality has to do with this item--it hardly corresponds to the best world achievements in this area. The list of items like these could be extremely long.

The drive for increasing the number of items with the Emblem of Quality and the lack of effective conditions for not allowing the state Emblem of Quality to be conferred on items that do not meet the requirements of the highest quality category also lead to the situation.

The state normative documents developed by the Gosstandart for organizing the work in the area of certifying products in various quality categories do not regulate the responsibility of the state certification commissions. When any product is deprived of the Emblem of Quality because it does not deserve it, no one can remember who has awarded this item the Emblem of Quality without any justification. On the other hand, the organization of the work of the commissions at the manufacturing enterprise and the preliminary evaluation of the level of quality of the products certified by the organizations of the manufacturing branch as well as the inadequate competence of members of the commissions do not create conditions for guaranteed realization of the high requirements of the system of product certification.

A number of provisions of the system for state certification of product quality must be revised, providing not only for maximally objective evaluation of products, but also for the corresponding legal and material responsibility of the certification commissions. It is necessary to extend certification to all industrial products and not reduce the range of them from year to year.

It would be expedient to revise the content of work included in the plans of branches for the creation and introduction of new technical equipment, envisioning including in them only work that culminates with:

new theoretical provisions with recommendations for their practical utilization in applied scientific research or experimental design work;

the creation of principally new technical equipment or technology for which it is suggested that patents or author's certificates be acquired;

the creation of new technical equipment which will provide for a reduction or elimination of imports;

the creation of new, highly effective methods of solving problems of product quality control.

The next essential factor influencing the quality of products that are produced is price setting. I should like to note first and foremost the small degree of effectiveness of increments that are introduced to wholesale prices for items that have received the state Emblem of Quality. A large part of the items with the Emblem of Quality do not have these increments and for those that have received them the increment is quite insignificant and does little to motivate the enterprises to produce items of the highest quality category. There are a whole number of obstacles on the path to effective application of these increments. The procedure for formulating the increments is lengthy, complicated and separated in time from the moment of certification. If the profitability of the items is higher than the normatives, the increment is not established at all. A mandatory condition for establishing increments is the consumer's agreement, and this is not always advantageous to him, and so forth.

Any item that is certified for the higher quality category absolutely must have an increment to the wholesale price. Moreover, in our opinion, the increment should be established simultaneously with the awarding of the Emblem of Quality to the item, and in considerably larger amounts than now.

Additionally, it should be noted that it is disadvantageous for the manager to do work for preparing items for certification for the state Emblem of Quality as compared to work for reducing the production cost of items, for the increment that is received in the final analysis turns out to be considerably less than above-normative profitability obtained from reducing the production cost of the product. Here one must take into account that the additional profitability resulting from this is received by the enterprise without any coordination or approval at higher levels, and it reaches 100 percent and more.

The next important question concerns the dependency of the manufacturer on the final consumer.

If one excludes from consideration the return of completely rejected products to the manufacturer, the manufacturer is practically not dependent on the

quality of the final sale of the product. This pertains especially to the period when the delivery plan has been fulfilled and the enterprise is not very interested in whether there is a demand for its products or not. After all, the wage fund and the material incentive fund do not depend on these, given sales. In the existing practice the manufacturer is not very interested in producing and putting out precisely those products which the consumer wants. If one takes into account the fact that practically every plant that manufactures products is, in turn, a consumer for another plant and depends on the quantity and quality of products delivered to it, under these conditions it is not at all simple to display initiative and take on responsibility and responsibilities for satisfying the demand for product T-41/17.

Fortunately, the situation in this problem is fairly stable and therefore one can cite an extremely instructive example as an illustration.

In an article entitled "He Who Takes a Risk Wins" (PRAVDA, 2 October 1983) it was noted: "The Orsha sewing workers decided to try a path no one had ever taken before. They suggested that their trade partners introduce into the text of the delivery agreement the following point: in the event that 30 percent of some of the items of any model are not sold within a period of up to 2 months the purchaser (trade organization—editor's remark) has a right to return them to the factory. The factory commits itself to changing the model to one on the spot. All expenditures on exchange and subsequent sales of the items that are returned will be made by the factory...." We think that all manufacturers should do exactly this. But what happened as a result? As a result there was a sharp increase in the return of items, although at the same time there was also an increase in the volume of new models that were being introduced--from 35-40 before the experiment (per year) to 210. What was happening? It turned out that the factory, having begun the experiment, did not repeat its "rear"--that is the quality and assortment of the fabrics. The index of updating of the fabrics at the factory was in the range of up to 10 percent per year. Compare--210 models (about 50 percent) per year or 10 percent! As a result, the following sad picture of returns was received:

1981	3,500 items (111,000 rubles);
1982	32,000 items (857,000 rubles);
1983	64,800 items (2,037,000 rubles).

One can imagine without any special difficulty what economic, material and moral incentives began to act on the collective of workers at the factory under these conditions.

It was a very good beginning, an extremely sad end. And the factory probably remained familiar with the fabrics. But what about the other enterprises?

Some economists established long ago that in the system of control, including control of product quality, it is not enough to change one unit--it is necessary to change all units. If the factory changes over to new economic incentives with a consumer, analogous changes must also be made for the supplier to the factory, the system of incentives and planning must be reformed and so forth.

In the example given above the management of the factory decided to introduce a system of product quality control not ~~in the~~ <sup>in</sup> ~~fact~~ <sup>fact</sup> in essence, and they managed to do this. But the economic dependence on the supplies made it impossible to obtain the expected effect if no changes were not made throughout the entire chain: raw materials--finished materials--prepared products. In this connection we should like to touch upon a couple of general issues pertaining to the effectiveness of the methods for controlling product quality.

During the 1950's and 1960's in the ~~country~~ there was extensive dissemination of various systems for ensuring the quality of products and labor (the Saratov, the NORM, KANARSPI, SBT and other) which initially produced an effect as a result of better organization of production, strengthening of production discipline, a higher professional level, greater interest and responsibility on the part of the workers, and so forth.

But with time their effectiveness declined and they were no longer able to exert a significant influence on the quality of products and labor. An analysis of the content and experience in the introduction of these systems shows that they were not effective enough because they did not involve the basic levers of management of production--planning, financing, evaluation and incentives for enterprises, the wage system, the interrelations between developer and manufacturer, and so forth.

The situation is somewhat different with respect to comprehensive systems of product quality control (KSUKP). These require revision restructuring the basic levers of the economic mechanism so that they will have a more effective influence on product quality. But the development and introduction of these systems have proceeded along the path of creating a set of standards which resolve only organizational and technical issues, and mainly at the level of the enterprises. Economic and legal questions ended up outside the purview of these documents. In practice only the ~~Ministry~~ <sup>Ministry</sup> of Finance took on the difficult work of introducing them. Neither the KGB Complain, nor the USSR State Committee for Labor and Social Problems, nor the USSR State Committee for Prices, nor the State Committee for Science and Technology participated in this work and, as a result, the effectiveness of these systems also turned out to be low.

The example of the Orsha Sewing Factory illustrates the need to solve one more problem: elimination of the existing lack of correspondence between the requirements for quality of the initial production materials and the items made from them. Closely related to this problem is the question of the immense difference between the model of the item and the series analogue. At exhibitions we have all fallen in love with ~~individual~~ items and materials--clothing, footwear, fabrics, equipment, ~~etc.~~, <sup>etc.</sup> ~~individual~~ items and furniture, but what fate awaits these models? In the ~~present~~ <sup>present</sup> days, none of them do not go into series production for a number of reasons. Some of them do, but in a quantity so that it is practically impossible to find these items in the stores. Well, but some of these models will be produced in sufficiently large series, but it will be difficult to rework the exhibit items in these. When assimilating new models there are deviations from the designs, the

established initial material on the given technology, which also nullifies the labor of the developer and the user. It would be expedient to change the way these exhibitions are organized and organize two kinds of them: future items and new items. At exhibitions of future items they would present models that have already been developed but are only just earmarked for output, and at the exhibition of new items, only items that have been assimilated by industry during the year and no exhibition was organized. Additionally, at the exhibitions of new items, they should in parallel exhibit analogue models created before the beginning of series production in order to see what changes these models have undergone. Prizes of prizes, awards, certificates and so forth should be awarded only according to the results of the exhibitions of new items with unassimilated dependence of series models to the exhibited model. The exhibitions of future items should be informational and serve as one of the bases for forming plans for industrial production.

It is necessary to realize a simple principle. Either high-quality products are produced or production is discontinued. Losses arising here will more than be occupied by reducing losses from transferring materials resources into completely defective products.

The last question we would like to raise is the problem of protecting the interests of the consumer.

It seems expedient to us, for purposes of more effective support and protection of the interests of the consumers of industrial products and increased responsibility of the manufacturer (developer) to create a "Society of Consumers" analogous to scientific and technical societies. This society would be responsible for evaluating the quality of industrial products that come in from the trade network to the population, revealing products that are of poor quality and for which there is no demand, and forming public opinion and, to a certain degree, legislation.

In order to carry out the above, one could grant the society the right to organize exhibits of high-quality goods, and also exhibits of low-quality goods; participation in competitions for receiving experimental design work in certifying consumer quality; conducting questionnaires of public opinion; preparing and submitting recommendations changing lists (assortment) of consumer goods and their quality to the planning agencies of the branches of industry; providing control of the work of public inspectors of product quality in the trade network and industry; establishing a special bulletin reflecting public opinion concerning the quality of consumer goods.

#### CONCLUSION

1. Here and henceforth consumers are considered to be individual consumers and organizations that acquire products in the trade network.

DITION: Izdatelstvo "Sovetskaya Rossiya i organizatsiya promyshlennogo prizvostva", 1972.

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## CERTIFICATION OF DESIGNS SUGGESTED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMISHLENNOGO PROIZVODSTVA. (EKO) in Russian No 7, Jul 86 p 96

[Article by V. N. Tishchenko, candidate of economic sciences (Kharkov): "Introducing Certification of Design Schemes"]

[Text] At the present time the certification of product quality is done in the stage of series output. High-quality items are considered to be those with a high level of consumer qualities. And in this stage it is too late to reject products in which technically outdated solutions or design schemes have been used since considerable funds have already been invested in their production. The system of departmental and extradepartmental expert evaluations to some extent puts up a barrier against the output of certain obsolete items. But with expert evaluations there are no economic incentives or sanctions.

In order for the highest quality category to be earned by products that not only have a high level of consumer qualities but are also created on the basis of progressive technical decisions, in our opinion, it would be expedient to introduce certification of the design schemes in the stage of scientific research and experimental design work. There is now intraplant certification of technological processes, parts and assembly units, and this should also be introduced for NIOKR. Then, in the first place, a barrier would be put up against the creation of obsolete technical equipment in the stage of planning, and, second, the certification within the enterprise would encompass all stages of the work on the item.

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## RECOGNITION OF DEFECTIVE WORK (RGD)

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMYSHLENOGO PROIZVODSTVA (ENO) in Russian No 7, Jul 86 pp 97-98

[Article by L. F. Sukhodoyeva and M. V. Garbunova, teachers at the State University (Gorkiy): "Not Closing One's Eyes to Defects"]

[Text] For a long time the percentage of defective work was practically the only measure of the works of the enterprise in the area of quality, which is quite predictable since its indicator, on the one hand, registers cases of deviation from the given parameters of quality and, on the other, is reflected in bookkeeping in the value form of losses. But with the appearance of quality control systems people began to forget about this.

The following became the main parameters. The output of products of the highest quality category; the quality of the labor of workers, since bonuses were related to this indicator; the number of complaints, and the quarterly Report Form No III (Quality) which is prepared by the technical control service.

Defective work, as before, was registered and on the basis of data from bookkeeping entries, was entered in the column "defective work in production" and then on Form No 6 of the annual report (Section V, "Losses From Defective Work and Wastes"), but interest in it decreased.

An investigation of seven machine building enterprises of Gorkiy showed that it is usual for assignments for reducing expenditures on defective work to be submitted only to the technical control department, and the shop technical control bureaus do not know about it. A comparative analysis of the amount of losses from defective work in percentages of the production cost of the growth output showed that only for enterprises that do not have assembly shops is this indicator in the vicinity of hundredths of a percentage point, and for the other shops it exceeds 0.1 percent, reaching 2.29 percent for more complicated and responsible products.

In our opinion, the time has come to critically interpret what has been achieved in quality control and regulate the system of evaluation indicators without letting defective work slip from the field of vision. Even the indicator of complaints does not quite precisely reflect the true state of

affairs with defective work. If a defect can be eliminated through the favor of the consumer, he does not make a complaint. Why start a conflict with the supplier? And when the supplier and consumer have longstanding or fairly broad ties, the conflict is regulated by mutual agreement and is never documented. And, finally, the supplier tries in all ways not to admit the correctness of the complaint that is made since this deteriorates his indicators.

The indicator of complaints should be made more objective. It characterizes the attitude toward the enterprise's product in the external world. But one cannot refuse and reduce the effectiveness of the indicator of defective work as one of the most reliable indicators of the quality of work of the subdivisions and performers within the enterprise, which also reflects losses in production. In order to increase its influence it is necessary to account strictly for semimanufactured goods that are put into production. And such accounting is far from always in existence.

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## WAYS OF IMPROVING NATIONAL ECONOMY SUGGESTED

Novosibirsk EKONOMIKA I ORGANIZATSIIA POMYSLENOGO PROIZVODSTVA (ENO) in Russian No 7, Jul 86 pp 100-116

[Article by Sh. B. Sverdlik, doctor of economic sciences, professor, department chief of the Novosibirsk Institute of the National Economy: "The Enterprise and the Bank"]

[Text] The Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000 emphasize the need to strengthen conditions for economy, to extend all kinds of resources efficiently and economically, and to reduce losses of these.

During the first 3 years of the 11th Five-Year Plan the savings on raw material, processed materials, fuel, energy and other objects of labor amounted to 10.6 billion rubles,<sup>1</sup> while circulating capital in supplies of commodity and material values increased in industry by 31 billion rubles.<sup>2</sup> There was an incomparable increase in supplies of industrial products in warehouses of supply agencies and trade organizations. Material circulating capital in state enterprises and organizations per 1 ruble of national income used for consumption and accumulation increased from 69 kopecks in 1980 to 70 kopecks in 1983.

### The Supply Does Not Weigh Down the Pocket

Acceleration of the turnover of circulating capital is one of the factors in intensification of production. It can be achieved only under the condition of extensive introduction of extensive technology and technical equipment, advanced methods of controlling production and circulation, and continuous improvement of the quality of labor and products. The effectiveness of the utilization of circulating capital depends directly on the fulfillment by the enterprises of plans for the delivery of products and assignments for increasing labor productivity and assimilating production capacities, and at the same time it exerts a certain influence on the fulfillment of the indicated plans and assignments.

An acceleration of the circulation of material circulating capital in the industry by only 1 day is tantamount to increasing the volume of products by 1.5 percent without additional capital investments. A retardation of

circulation withdraws from economic circulation the material resources necessary for raising the standard of living of the population. The accumulation of above-plan, surplus and unnecessary supplies of raw and processed materials at certain enterprises leads to idle time of the labor force and equipment at other enterprises.

Increasing the effectiveness of the utilization of circulating capital is a universal national economic task. But the banks are at "greater pains" than other planning and control agencies to accelerate the circulation of this capital. By the beginning of 1985 short-term bank loans to industry reached an immense sum--100.9 billion rubles or more than 60 percent of all the circulating capital. For comparison let us say that in 1950 this proportion amounted to 33.1 percent, in 1960--39.2 percent and in 1970--43.6 percent.\*

A retardation of circulation and the withdrawal of material resources from economic circulation which this causes are the primary cause of the appearance of late payments on loans and this forces the bank to take out a considerable proportion of the loan fund to provide for accounts between consumers and suppliers. But, judging from numerous articles, the existing forms of bank controls with the ruble over economic and financial activity of enterprises do not satisfy both sides. Bank economists note frequent cases in which the enterprises violate credit, accounting and financial discipline and many enterprises take an irresponsible attitude toward the utilization of circulating capital and bank credit. Economic managers are dissatisfied with what in their opinion is trivial red tape on the part of bank institutions which limit their independence.

The main stumbling block is the evaluation of the results of the economic activity of the enterprises. Normative documents for the large-scale experiment determine the list of planned assignments whose fulfillment is taken into account by higher organizations and local agencies when evaluating the economic activity of associations and enterprises. Thus when summing up the results of the work and socialist competition of associations (enterprises) of the electrical equipment industry one takes into account the fulfillment of planned assignments for the volume of product sales on the basis of contractual commitments for deliveries, for the development of science and technology, the higher technical level (quality) of products, increased labor productivity, reduction of expenditures on production, and introduction of new production of capacities and facilities. With small variations similar lists of evaluation indicators have been established for enterprises of other industrial ministries that are operating under the conditions of the given experiment.

The fulfillment by the enterprises of planning assignments for the established limited range of indicators gives them the right to a number of privileges when utilizing bank credit. But these privileges are in effect up until the point when the reasons for the financial difficulties of the enterprise are of a temporary nature. The principles established in the 1930's for the time periods and the return of credit have not been abolished, and, conversely, they have been confirmed again in the "Basic Provisions Concerning Bank Credit," approved by the USSR Council of Ministers in 1982. Guided by these provisions the banks limit or completely curtail the issuance of new loans if

enterprises that are violating credit discipline. Enterprises that have fulfilled or overfulfilled planning assignments with respect to a majority of evaluation indicators also fall into the category of those being fined. In practice there are frequent cases when the ministry awards an enterprise a class position and large bonuses from the results of socialist competition but the bank removes this enterprise from credit and applies other sanctions against it.

Credit levers are directed mainly toward stimulating acceleration of the circulation of material resources and circulating capital invested in them. By exercising control over how effectively the enterprises utilize credit in circulating capital, the bank pursues no narrow departmental goals but achieves an increase in the return from public labor which is embodied in circulating capital and funds for circulation.

But the enterprises themselves and their higher organizations are fully responsible for this important national economic problem. The fuller the fulfillment of the production plan with respect to volume and products list, surplus warehouse supplies also serve as a reserve for covering losses of material resources in defective work and wastes, in the event that it is possible to exchange one "shortage" for another, and they serve as the token of gratitude to local organizations for assistance rendered to warehouses and the city.

The manager thinks about the harm of surplus warehouse supplies when he discovers that the material resources that are in short supply for fulfilling the production program lie in another's warehouse. Fortunately (but unfortunately), the volume of information concerning surplus resources is entirely random and episodic in nature and, having obtained it, the economic manager is most frequently inclined to blame his suppliers for inattentiveness and a lack of real power.

It has been theoretically presumed that payment for normed circulating capital for which there is no bank credit and interest on credit should, through profit, influence the reduction of deductions into the economic incentive fund. These hopes have not been justified, which is shown not only by the enterprises of individual enterprises, but by the more weighty evaluation of indicators of industry as a whole. In 1974 the material circulating capital of industry increased by 7 percent and payments from profit to the budget and funds for increased supplies amounted to approximately 400 million rubles which is equal to reducing the production cost of the products by only 0.1 percent. With this kind of attitude toward the "weight" categories, the task of accelerating the turnover of circulating capital remains practically beyond the field of vision of economic managers and the additional payments into the budget and expenditures for paying for bank credit and penalties to the suppliers cannot neutralize the advantage of non-normative supplies.

More considering the results of the activity of enterprises under their jurisdiction many ministries and main boards do not pay any attention to the bounds in fulfilling assignments for accelerating the turnover of circulating capital. Moreover, according to the conditions of the movement, the

ministries have been given the right to take from the enterprises 3 percent of the value of above-normative commodity and material values and uninstalled equipment that has not been bought with bank credit. The ministries have not taken advantage of this right and it has been necessary to transfer it to the USSR Ministry of Finance.

We shall not close our eyes to reality: as long as the supply does not weigh down the pocket, it, that is, the supply and not the pocket is "doomed" to inevitable growth. Any system of evaluation has the property of moving to the background all indicators that are not included in this system. As soon as the amount of the material incentive funds and the prestige of the director depend on the fulfillment of indicators "A", "B" and "C", he is prepared for the sake of them to sacrifice all the rest of the indicators right up to "Z," inclusive. It is precisely here than we find the root of all conflicts that arise between the enterprises and the banks.

#### When There Is no Agreement in Indicators

For the reader who is removed from the supply business there naturally arises a legitimate question: Where do they get above-normative supplies and surplus and unnecessary material values if the basic kinds of material resources are allotted to the enterprises strictly according to the funds and orders, and the enterprises have to "scare up" each ton of metal and other resources with immense amounts of work?

Ostat Bender stated that he has 400 relatively honorably ways of removing or "lifting" other people's money. An experienced supply worker has in his arsenal thousands of relatively honorable ways of obtaining more material values from state funds than he actually needs. It is possible to increase the expenditure norms, especially for newly assimilated products, and the average weighted group and experimental-statistical norms. It is possible to reduce the residuals of materials and batching items expected in the warehouse and in incomplete production at the beginning of the planning year and, conversely, to increase the carryover residual for the end of the year. Most frequently these "mistakes" go unnoticed for to check on the substantiation of the calculations of tens of thousands of production associations, construction projects and other consumers of material and technical resources on an immense products list which includes hundreds of thousands of names is a job that is beyond the capabilities of even the largest computers of the very latest generation. Essentially, control is limited to large "shortage" positions in the balance of material resources. Moreover, an increased order is not a write-up, and is not criminally punished.

It would not be an exaggeration to say that the accumulation of surplus supplies of material values and the retention of internal circulating capital and other disproportions which have a negative effect on the financial activity of the enterprises and their ability to pay take form even in the stage of the development of technical and industrial financial plans. Recent normative documents have repeatedly emphasized the need to provide for stability and balance of indicators of the five-year and annual plans for the development of the national economy at all levels, but we have not managed to achieve a decisive change in this area yet. An unbalanced plan is a

convenient screen for writing off all management errors and therefore the ministries and main boards except from the enterprises drafts of plans in which the income does not equal the expenditure, and from time to time the enterprises do not notice obvious lapses in planning assignments that are established from above. The coordination of planning indicators, especially physical and value indicators, is not anything extraordinary, but a normal "game of pressure" between the enterprise and its higher organization.

The Sibelektroterm Association, which entered the large-scale economic experiment at the beginning of 1984, accepted for execution a plan established by the higher organization in which the volume of product output in the products list exceeded the commodity output in wholesale prices by 15 percent. Using the products list plan they ordered materials, batching items and equipment, which was a fairly good support for fulfilling the value plan for product output. For the first three quarters in a row, the association did not fulfill the plan for the products list, but accurately reported 100 percent fulfillment of contractual commitments since the orders for sales the deliveries are indicated not for the month and not even for the quarter, but for the half year or the year. At the end of the year the higher organization has "recognized" its mistake and has excluded the excess pieces from the products list plan, but the association has agreed with the clients to transfer the delivery deadlines to the next year. To be sure, instead of planned acceleration of the circulation of normed circulating capital by 3.2 days, there was a retardation by 49.3 days and a total of about 6 million rubles were taken in commodity and material values were taken out of economic circulation, for which the budget, the bank and the suppliers were paid a total of more than 600,000 rubles in fines. Nonetheless, according to existing conditions the association has been given the right to additional deductions into the material incentive fund in an amount of 15 percent in excess of the sum envisioned in the financial plan.

A similar situation exists in the Elektroagregat Association. The quality of the plan is shown at least by the fact that its indicators in 1984 were "refined" 32 times. For this reason the supplies of material values exceeded the normative 1.5-fold and the interest paid on credit was twice as much as was planned. But neither the material incentive funds nor the bonuses for management personnel suffered from this.

Inspections by bank enterprises of Novosibirsk Oblast in 1984 established the unsubstantiated reduction of sales plans for 15 enterprises in heavy industry by 9 million rubles, and in 1985--for 29 enterprises by 31 million rubles. Only one ministry responded to the results of these inspections and brought the sales plan into line with the real capabilities of the enterprises under its jurisdiction, and the remaining enterprises said and wrote nothing about this.

The neglect of accounting, the very thing that is considered to be the mirror of the economic activity of the enterprise also makes its contribution to the discoordination of planning indicators. Mirrors are sometimes also distorted....

The currently prevailing boiler method of accounting for expenditures on production makes it possible within a wide range to maneuver proportions of their distribution for prepared products and incomplete production. The lack of systematic accounting for parts and components again creates favorable conditions for writing off as incomplete production defective work, nonliquid assets and other discharge expenditures or simply write-offs. One might say that this kind of accounting is advantageous to the enterprise from all standpoints. With its help workers of the enterprise "control" the fund-forming indicators and regulate the amount of the overall and material resources per ruble of commodity output as well as the increase in labor productivity and monetary accumulations.

It has become an unwritten rule to conduct a real inventory of commodity and material values when a new director comes to the enterprise "from the outside." The Novosibirsk Association's Tyazhstankogidropress and Sibselmash after these inventories wrote off as losses considerable sums of materials, semimanufactured products and prepared items. But what happens to the "old" director who himself has put his hand to accumulating these "values"? All he can do is act as though they do not exist in nature. Therefore the above-normative residuals of commodity and material values accounted for in the bookkeeping balances of the enterprises at the beginning of the planned year are not included in the calculations for material and technical supply or the production and sales of commercial products.

It is clear even to someone who is not an economist that if the plan is drawn up with errors, if its indicators are not coordinated with each other, it is inevitable that there will be a financial disparity and a lack of balance between the monetary incomes of the enterprises and their expenditures which, in turn, gives rise to an increased demand for bank credit. The lack of order of the system of planning sources for financing circulating capital also contributes to this.

#### Loans or Manna From Heaven?

The principles for the organization of circulating capital that originated at the beginning of the 1930's were directed toward providing for economic independence of enterprises and for their responsibility for the production and financial results of their activity. The state economic organizations were allotted their own circulating capital in amounts necessary for forming minimum supplies of raw materials, processed materials, fuel, semimanufactured products and incomplete production, prepared items and goods, and also investments in expenditures of future years.

The Council of Labor and Defense, by a decree of 23 July 1931, clearly determined the limits of bank short-term credit for circulating capital. The credit should be granted only for needs related to advancing seasonal processes of production, accumulating seasonal supplies of raw materials, processed materials, prepared products and goods and for other temporary needs ensuing from the course of production and circulation of commodities. The loans are granted strictly according to a special purpose for a particular, clearly established time period, with the guarantee of their return after the expiration of the time period and commodity and material values as collateral.

the first principles noted above for organizing circulating capital within the framework of industrial enterprises and the banks. Credit for commodity and material values was used mainly by the enterprises of seasonal branches of industry with a short production cycle and guaranteed sales of the final products. The normatives of internal circulating capital of enterprises of seasonal branches and especially heavy industry were sufficient to cover the residuals of commodity and material values, and they resorted to external credit only in exceptional cases. By 1950 68 percent of the material and circulating capital of the industry was covered by its own funds. In the subsequent years the proportion of internal circulating capital in material and circulating capital began to decrease sharply: in 1960 it amounted to 60 percent, in 1970--about 49 percent, and in 1980--41 percent.<sup>5</sup>

In practice the enterprises do not independently determine the need for internal circulating capital and they do not augment these funds from their own profit, which has led to a gradual separation of the normative from the value of minimal nonreducible supplies of commodity and material values.

In keeping with the decisions of the July (1960) Plenum of the CPSU Central Committee and the subsequent decree of the USSR Council of Ministers of 1962, "On Improving Norm Setting for Circulating Capital of State Enterprises and Organizations," through the forces of many scientific research institutions, a library of provisions has been created for the development of norms and normatives for circulating capital. The calculations introduced in this period have raised the level of provision of enterprises with their own circulating capital, but interruptions soon began to return for the existing policy of centralized planning of sources of financing the increase of these funds had not been abolished.

The decree of the CPSU Central Committee and the USSR Council of Ministers of 12 July 1979, "On Improving Planning and Stepping the Influence of the Economic Mechanism on Increasing the Effectiveness of Production and Improving the Quality of Work," made it incumbent on industrial ministries of the USSR, with the agreement of the USSR Ministry of Finance, to establish economically substantiated normatives for circulating capital and, under the 11th Five-Year Plan, to bring the amounts of circulating capital of production associations (enterprises) in line with the indicated normatives. Facts show that this time the ministries were guided by immediate financial considerations, not thinking about future planning based on economically substantiated norms and normatives that would be in effect for a long time.

The economy will not tolerate a vacuum. The missing circulating capital has gradually begun to be replaced by borrowed money. The circumstance that the overall need for circulating capital is generally not planned has also contributed to this. In the annual financial plan approved by the higher organization, they envision sources of increasing the normative of internal circulating capital, and in quarterly credit plans of the banks--limits (or control figures) for indebtedness on loans for above-normative seasonal and other special supplies in the cross-section of the branches and enterprises, and personalized limits on credit for temporary needs. As we know, too many branches in the branch.

Granting credit to enterprises of nonseasonal branches of industry for circulation has become widespread. The bank takes from the enterprise half of the normative internal circulating capital and in exchange opens a special loan account for it to pay for acceptance account documents for the acquired material values and services for its basic activity and issuing funds for wages.

The policy for issuing loans for above-normative residuals of commodity and material values has been simplified. While previously the enterprise had to prove to the bank that the excess of the normative was temporary in nature and therefore the requested loan would be repaid within a time period of 10 months, now the bank must prove to the enterprise that the existing above-normative residuals cannot be covered by credit either fully or partially for they contain unmarketable, leftover, incomplete, nonstandard, surplus, unnecessary and other material values that are not eligible for credit.

Especially popular among the enterprises are the so-called payment credits which are granted by the banks for payment of account documents for material values and services when there is a shortage of funds in the accounts. Initially the borrower was obligated to repay the credit within a month, but then the time periods for the use of the money were gradually increased to 4 months. Added to this is credit granted for settling accounts for mutual demands. The worse, the better, thinks the experienced manager and he accumulates for the next interministry account, usually conducted at the end of the year, the sum of extended payments to suppliers so that as a result of account credit he can live well until May of the following year. There has been a tendency toward crowding out planned credit for above-plan commodity and material values with payment and account credit, for which the bank does not check at all on the special-purpose utilization. In what way is this not manna from heaven?

K. Marx said that the easier it is to obtain a loan the more people obtain them. Economic managers have lost their taste for their own circulating capital, which had to be earned, and they are continuing to obtain from the "miserly knight" sitting in the bank removals of even those small restrictions which remained for extending credit to enterprises that regularly fail to fulfill their economic and financial commitments, and primarily unimpeded payment with credit for all documents for commodity and material values and services.

It should be emphasized that there is a certain reason for this requirement. The sanctions applied for poorly operating enterprises in the form of removal from credit or curtailment of the issuance of payment credit has a ricochet effect throughout all of its suppliers, who are fulfilling their contractual commitments precisely. They do not have a right to send the products to other purchasers and stopping the shipments to customers who do not pay their bills undermines the fulfillment of the plan for sales and profit. It is enough for even one enterprise to "declare itself insolvent" even for a short period of time for the chain to threaten the solvency of dozens and perhaps even hundreds of economic agencies that are guilty of nothing. The party who suffers is even the state budget which fails to receive part of the planned

revenue from turnover tax and products from profit. If the bank makes a compromise, the sanctions are removed and again the loan money covers all financial gaps of the enterprise. To develop financial and credit relations and strengthen payment discipline in the national economy--these are the tasks set by the Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year .

### The Economic Mechanism and Bank Control With the Ruble

The economic mechanism is not only and not so much a summary of laws, provisions, instructions and so forth, but mainly the ability to take advantage of the right granted by these documents in order to achieve high final results in the area of labor activity with which one is entrusted and a keener sense of responsibility for these results.

Obviously, with time it will be possible to develop a pleiad of economic managers who have all of the aforementioned qualities and create an atmosphere within the labor collectives wherein external control over economic activity will no longer be necessary. But for the time being external control must be improved, it must be made more effective and at the same time it is necessary to expunge from it elements of formalism and favoritism which, as was pointed out at the April (1985) Plenum of the CPSU Central Committee, separate people from their work and create a nervous situation.

In what direction should the forms and methods of bank control improve under the conditions of the large-scale economic experiment? Let us try to answer this question without claiming, naturally, that our suggestions are indisputable.

One of the main elements of the concept of restructuring the economic mechanism suggested by the party is the introduction of true cost accounting. Are we correct in thinking that an enterprise has cost accounting when there is no balanced plan or well-arranged accounting? It is purely a rhetorical question for the plan and accounting are two buttresses on which the entire system of cost-accounting activity of the production collectives rests. There are more than enough decrees and decisions concerning enlisting workers for participation in the development of five-year and annual plans even now. What additional rights do managers need in order to provide for reliable report data and introduce progressive forms of normative accounting, which have been under discussion for more than one decade?

Let us imagine this picture. The bank, with the participation of financial agencies and, if necessary, enlisting specialists from scientific research and higher educational institutions, just before or at the beginning of the year checks on the balance of physical and value indicators of the plans for material and technical supply, production, deliveries and sales of products, the financial plan and so forth. Having discovered a disagreement among these indicators, the people doing the verifying report this at a general meeting of the collective and give a warning that the bank will stop paying all the bonuses due to the enterprise until this matter is put in order. A similar measure of influence can be sanctioned by legislation with respect to enterprises that neglect accounting and distort reports. Indeed, what is the

justification for a bonus if the plan is not a plan and the account is not an account!

I can foresee the objection that the balance indicators come "from above" and the lower levels suffer for the sins of the higher levels. But if the collective, on the basis of an analysis conducted by "efficient economists" reject the established but unbalanced planning indicators, the "efficient" administrator will be obliged to rectify the situation. It is precisely this kind of cooperation between economists and administrators that V. I. Lenin contrasted to the production of meaningless theory.

Including the banks in the verification of this substantiation and balance of the plans of the enterprises is not an innovation; it is already being practiced, and fairly successfully, in many interrelations between bank-straybank institutions, builders and contracting organizations. This, of course, does not mean that the bank will dictate to the enterprise which product to produce and whom to sell them to, which material resources to use, and so forth. The solution to these and other production, technical and commercial problems remains fully within the competence of the economic managers of the corresponding level with only one condition--the indicators of the plan must be coordinated and incomes and expenditures must be balanced.

Let us trace the possible effect from shifting the center of gravity of control with the ruble from the subsequent stage, where it is exercised at the present time, to the preplanning stage. Orders for material resources are distributed by the enterprises long before the establishment of the plan by the output of products and completion of the portfolio of orders and contracts for delivery. The data from the analysis we conducted show that only in four of this principle does the declared need for material resources exceed the real need calculated for the established list of products to be produced by no less than 20 percent. The enterprise has the right to adjust its preliminary orders, but it rarely does this because of the labor-intensiveness of the calculations and in the hope that the bank will grant the credit anyway. At some point in the middle of the year the cat gets out of the bag: the bank begins with warnings and ends with sanctions. But the bank is no longer able to stop the income of surplus resources to the enterprise--the supply conveyor cannot be turned back.

Preplanning control can warn about the appearance of these disproportions and at the same time it creates conditions for more complete utilization of the advantages of credit methods of supplying the needs of enterprises for circulating capital. Having been convinced that the overall cost of the material resources ordered for the enterprise does not exceed the actual needs for them (for the output of products, increasing carryover supplies and other needs) and that the sale of all the products planned for output is provided for by agreements and orders, the bank concludes a credit agreement with the enterprise. It stipulates:

- a) the limit on income of material values within the range of which the bank, without question pays from the account, and when there is no money in it--from a separate loan account, all bills accepted by the enterprise for material values and services;

b) the time periods for using credit in keeping with the calculated duration of circulation of the normed circulating capital;

c) the sum of the additional need for credit for commodity and material values formed because of the removal from production of outdated items, the assimilation of the output of new products, improvement of the technological process, and temporary reduction of the production volume during the period of reconstruction and modernization of equipment.

The credit agreement should also stipulate the issuance of the loan for the payment of wages and bonuses within the limits of the sums due to the enterprise and for other production needs. On behalf of the enterprise the credit agreement is signed by representatives of the administration and the trade union organization who are authorized to do this.

The technical aspect of the proposed approach to restructuring interrelations between the enterprise and the bank would hardly be of interest to a broad range of EKO readers. Another thing that is important: strengthening preliminary control over the balance of planning indicators expands the possibilities for the enterprises to maneuver, relieves them from their Big brother relationship with the bank and at the same time prevents using bank credit for surplus and unnecessary supplies of commodity and material values.

The consistent implementation of decisions of central agencies concerning the introduction of the normative method of distributing profit will also contribute to expanding the independence of the enterprises. So far profit that is officially left at the disposal of the enterprises (after paying all the planned payments into the budget) recorded by the higher organizations under various items--for financing capital investments, the economic incentive fund, and so forth. It is necessary to entrust the enterprises to determine independently the need for circulating capital and to augment these funds with profit left at their disposal. This will make it possible to release credit resources that have been tied up in undiminishing supplies of commodity and material values and to use them to expand the output and improve the quality of products that are in demand among the consumers.

And the last thing. There is an immediate need to unify the system of evaluation of economic activity of the enterprises. When one control agency gives an enterprise encouragement for good work and another punishes the same enterprise for poor indicators, executive discipline and the interests of the state as a whole suffer. It is necessary to arrange this system in terms of final results of the work, which are the fulfillment of all the commitments to the consumers, the state budget, the bank and the suppliers of material resources.

#### FOOTNOTES

1. EKONOMICHESKAYA GAZETA, No 1, 1985, p 5.

2. "Narodnoye khozyaystvo SSSR v 1983 g." [The USSR National Economy in 1983], Moscow, "Statistika", 1984, p 542.

3. Ibid., p 409, 542.
4. "Narodnaya khozyaystvo SSSR v 1965 g.", Moscow, "Statistika", 1966, p 752;  
"Narodnaya khozyaystvo SSSR v 1970 g.", Moscow, "Statistika", 1971, p 710;  
"Narodnaya khozyaystvo SSSR v 1980 g.", Moscow, "Statistika", 1981, p 511;  
"Narodnaya khozyaystvo SSSR v 1983 g.", Moscow, "Statistika", 1985, pp 558,  
580.
5. Calculation from sources indicated in footnote 6.

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## BENEFITS FROM MANAGEMENT CONSULTING RELATED

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMYSHLENNOGO PROIZVODSTVA (EKD) in Russian No 7, Jul 86 pp 117-129

[Article by A. Ye. Luzin, candidate of economic sciences, Moscow State University: "Increasing Receptiveness to Innovations"]

[Text] Aleksandr Yevgenyevich Luzin has been employed in management consulting for more than 15 years and is working in this area as a part of the Commission for Management Consulting under the VSNTO [All-Union Council of Scientific Engineering and Technical Societies]. He worked abroad for 5 years as a management consultant for the International Organization of Labor. We offer the readers his article in which he shares his reflections.

At the June (1985) Conference of the CPSU Central Committee increasing receptiveness to innovations was named as one of the most important conditions for accelerating scientific and technical progress. In solving this problem the attention of many organizations has traditionally been concentrated on searching for ways of multiplying the forces for introduction and, perhaps, therefore there has been no time left to think about possible alternatives. But they exist, and the most obvious and logical alternative is "approaching from the rear" in order to reduce the influence of the forces of rejection (see Fig. 1).

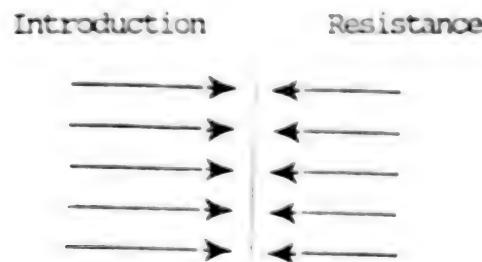


Fig. 1. "Power fields" of the process of innovation.

Sometimes one gets the impression that the rejection of innovations in enterprises and organizations is generated by exceptional sluggish bureaucratism, laziness and other subjective factors. On the pages of magazines one can always find the image of the "red tape artist," the "expert" of new technical equipment. Without trying to diminish the vital importance of this image and its fatal influence on the destiny of innovations, nevertheless let us be so bold as to assert that in the majority of cases the bulk of the forces of rejection of innovations are composed of objective factors. In real life the difficulties of innovations are like the difficulties of a passenger who is trying to jump onto a rapidly moving train. In this case the train is the basic production process.

As follows from Fig. 2, the innovative and the stage production processes have a number of radical differences which make the task of combining them extremely difficult and in some cases practically impossible. In the majority of cases, the managers of enterprises and personnel resolve the contradictions that arise between them in favor of the production process which determines the course of the fulfillment of the plan.

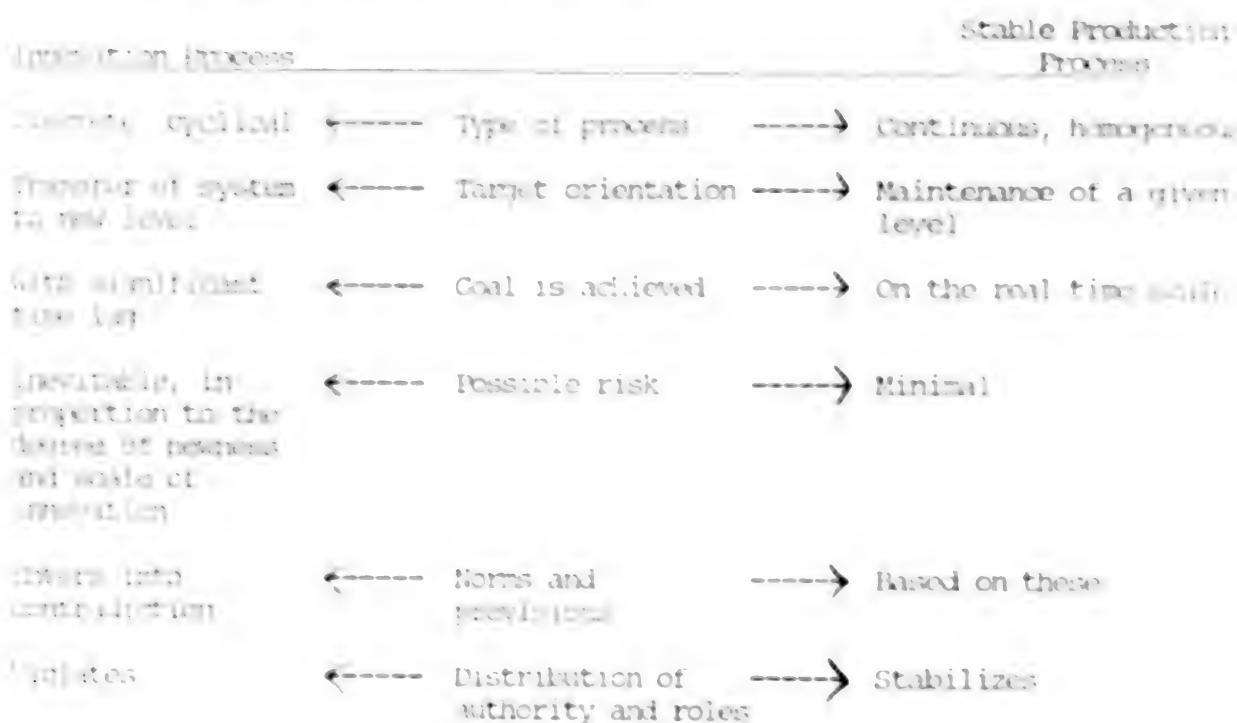


Fig. 2. Several Differences Between Innovation and Ordinary Production Processes.

The solution to the problem lies on the path of reducing the contradictions between the given processes: on the one hand, as a result of optimizing the cycle of introduction and on the other, through increasing the flexibility and innovative receptivity of the production system. That is, using the analogy to the train once again, one should organize things in such a way that, without getting the train off schedule, it will be possible for the passenger in one way or another to take a seat in the car.

Thus, if we break down the organizational mechanism of the enterprise into individual and subsystem elements we can weigh the extent to which in this or that element the conditions they meet the requirements of advancing innovations and, thereby, evaluate the innovative potential of the elements under consideration. The table gives the structure of the innovative potential of the organizational mechanism. Although the picture that is presented is far from definitive, nonetheless it makes it possible to draw certain conclusions. First, that the innovative process penetrates the entire organization and influences in another kind of influence on practically all subsystems and elements without exception. The second important conclusion is that the increase in the innovative potential is achieved mainly as a result of increasing the flexibility and adaptive capacity of elements of the organization.

Thus, a more detailed analysis of the table provides justification for drawing the conclusion that increasing the innovative potential involves considerable problems. The situation is complicated also by the fact that increasing the potential of one element or another frequently enters into contradiction with the condition of the system as a whole, and this leads to the appearance of tension and conflict. Thus, for example, the introduction of flexible organizational forms of the type of the matrix structure without changing the evaluation and payment for workers, the style of management or the communications network almost inevitably causes rejection of the given innovation. The conclusion: before beginning to increase the innovative potential it is necessary to have a clear idea of the nature, the depth, the urgency and many other attributes of the desired innovation.

Breaking the innovation process down into a number of phases and formulating the requirements for the condition of the organizational mechanism for successful realization of each of them leads to the conclusion that there is no single "optimal" condition of the organizational system for successful realization of all phases of even one innovation process.

The innovation process can be broken down into four conventional phases: the borrowing and generation of innovations; selection and formation; realization; fixation. Let us consider how the specific features of the phase are reflected in the requirements for the condition of the organizational system.

Phase One--"Borrowing and Generating Ideas" is realized best under the conditions of maximum mobility and freedom of the organizational mechanism. Great success is achieved by organizations that have a whole network of channels, methods and flexible forms of conducting dialogue with the surrounding world. It turns out to be quite useful to enlist on a temporary basis people who have ideas from other organizations and to create in the organization a climate of search which includes the possibility of free expression and discussion of any projects and ideas, regardless of how absurd they may seem at first glance.

Table--Structure of Innovation Potential of Organization

Elements of Organization Mechanism	Low	Innovation Potential	High
Organizational structure	Linear, linear-functional	Linear-functional with elements of target-principle organizational formations, matrixical structures	
Technology	Specialized production equipment rigidly joined into a unified flow for mass output of products	Flexible automated production modules linked by a nonrail transportation system	
Production or design premises	Specially designed for given production process--complete utilization of space	It a universal type, the availability of reserve space and the possibility of changing the grouping of shops and departments	
Organization of labor	Individual, operation by operation	Brigade, with high level of combination of operations and occupations	
Wages	Individual, piece rate	Time-rate, bonus, group with utilization of coefficient of labor participation	
Mobility of personnel	Minimal, mainly along the hierarchical ladder	Possibilities of horizontal and vertical shifts in keeping with tasks that are being performed	
Style of management decisions	Authoritarian, minimal delegation of authority, rigid control over utilization	Delegation of authority, providing for high degree of enlistment of personnel in development	
System of informing personnel	Operational information about fulfilling planned assignments by the given subdivision	Detailed information about activity of organization as a whole, its life, problems and tasks	
Psychological climate	Attitude toward solving current problems within the framework of their own work position	Attitude toward search for solutions, both immediate and long-range: both within the work position and beyond it.	

In view of the scope and importance of the activities of these companies in nearly all countries which exist in this region, generally accepted for the corporation type. An indispensable part of these activities will be the "marketing" function, which will be performed by the Japanese and the Western. It will come to collective "tourist" agencies in formalized procedure for the purpose of the trip.

The style of epineurium does not differ in either gross or fine structure from that present in the style of *Thysanotus* sp. The only minor source of difference is subepineurial and epineurial nerve fibers which tend to run the length of nerve and between the peripheral filaments, particularly in the region of the perineurium.

the described condition of the patient, and the stability of the condition with time, that would be the major factor of the therapeutic process, during the follow-up examination and interpretation of information. The information analysis, during a therapeutic session, shows the behavior of family health, family communication, and the adjustment of the members of family, according to the changes in the individual health condition.

The organization of working-class communities within the framework of family, extended and peasant groups, on the one hand, while on the other hand, the working-class initiative is a style of behavior that contradicts, in its principles and perspectives of human initiative of the workers, and, at the same time, provides for efficient mobilization and direction toward a common goal that has been set.

fairly typical of this phase of the innovation process is a situation in which many valuable ideas and projects are killed at an early stage simply because their potential has not been properly recognized and communicated, because in the organization there has been no truly major sponsor prepared to fight for the innovation. That is, the idea has an happened chance of "surviving" and, in the final analysis, the introduction and use of an innovation is less than ten times as likely to have "parents." The typical example of the phenomenon that has been described, many Western companies have the existing conditions for "personalization" of innovations, although they are not in enterprises

about the given idea the possibility to participate in all stages of its implementation. If the "father" of the potential innovation is a person from outside, the company looks for ways of involving him in the introduction of the innovation on a temporary or permanent basis.

Apparently this path is the most rational. So many innovations have not produced an effect simply because the inventors have not been involved in their realization!

In the stage of realization there is an "acclimatization" of the innovation in the existing organizational mechanism, that is, the innovation becomes an integral element of the given system. While in preceding phases the process of preparation of the innovation could be carried out autonomously, having separated it from the basic production process, in the stage of implantation it is inevitably necessary to solve the problem of how to implement the innovation with minimum harm to the basic production process. Under these conditions risk and possible interruptions must be reduced to a minimum, which can be done only by raising the level of formalization of the process of implementation and with efficient distribution of duties.

The implantation of a serious innovation requires at least a doubling of management resources. Simple delegation of this task to a production subdivision very frequently places its workers in a position of choosing: to implement either the fulfillment of the plan or the innovation. It is not difficult to guess the one to which preference is given.

In no case should one belittle the significance of the phase of fixation. Frequently innovations die out simply because they are given less attention at the completion of the stage of realization. Therefore when developing the stage of "fixation" one should include measures, provisions and procedures which would make it possible for personnel of the organization to use the methods that preceded the innovation. Moreover, they should contribute to a situation where the personnel become attached to the innovation so that after a certain period of time the innovation will become customary and necessary.

In spite of the seeming obviousness and logical substantiation of the stage of fixation, it frequently recedes from the field of vision of the organizers of the innovation. But even in those cases, when various measures are envisioned they do not always take into account the need for strict control over the implementation of this phase of the innovation process. A situation arises similar to the one that sometimes occurs when printing photographs: they have forgotten to put the photograph into the fixer and so the developed picture gradually fades and ceases to exist.

The determination of the time required for "fixation" and the "recipes" of organizational measures are not simple matters. Success comes with experience. I recall a case I encountered while working abroad. The organization had planned a changeover to the utilization of dictaphone equipment. Everything was done in keeping with a carefully developed strategy which, in particular, included the participation of each worker in a specially organized training course which ended with a test. There was first-class technical equipment and trained typists and specialists who understood the

advantages of utilizing the dictaphones (the time for preparing documents was reduced by approximately half) and who were able to use this equipment. But the people did not want to give up their customary work methods, so the innovation would have died if the management had not decided to take firm measures. An order was issued according to which after a certain date, not a single handwritten document would be accepted for typing. A half-year later the innovation had become so firmly entrenched that nobody could think about returning to pen and paper.

Many innovations are carried out not by one but by a number of organizations. For example, the development of a new machine is done by a scientific research or planning-design institute, but the enterprise realizes only the third and fourth phases of the innovation process--realization and fixation. Correspondingly, the innovation potential of a given enterprise should be distinguished significantly from the potential of an enterprise which takes on all functions for carrying out the complete innovation cycle. Therefore it would hardly be expedient to discuss the innovation potential of an organization as a whole without concretizing the nature and type of innovations, how radical they are, and the functions of the enterprise upon realization.

Activity directed at increasing the innovation potential of the organization as a whole is extremely problematic. It is considerably more effective to conduct measures in the various zones of the organizational system, within whose framework the most significant innovations are realized.

The "zonal" approach, taking into account the phases of the innovation process, makes it possible to minimize efforts and funds necessary for increasing the receptivity of the organizations to a particular kind of innovation. A specially designed innovation mechanism is created which is arranged on the basic production process without violating its integrity.

It is useful to organize temporary innovation subdivisions with target functions. With this approach it is possible to minimize the objective contradictions that exist between the innovative and the basic production process. Then the innovation mechanism turns out to be more viable, controllable and mobile, and its target character is more clearly determined.

It is expedient to utilize ideas of the innovation "splash" in organizational subsystems. This method makes it possible to approach systematically the enlistment of various services and subdivisions in the realization of the innovation (see Fig. 3).

Unfortunately, fairly frequently not enough attention is paid to enlisting personnel in the innovation process, which is fraught with a number of negative phenomena. As a rule, some of the personnel are overloaded since, in addition to performing their own production functions, they must do a large amount of work for introducing the innovation. Additionally, one loses track of the need to enlist in the innovation process workers from other subdivisions who, at first glance, have nothing directly to do with the given innovation.

Innovation "Splash" and  
Distribution of Roles

Participation of Personnel in  
Production and Investment Processes

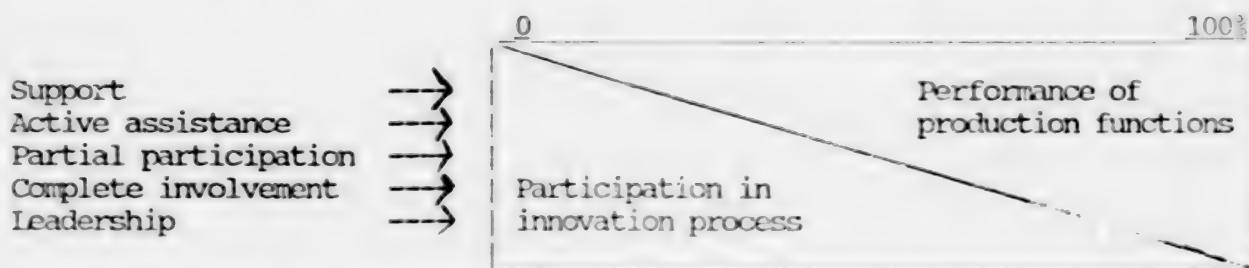


Fig. 3. Degree of Enlistment Organization Personnel in Innovation Process.

In order to create the most favorable situation for realizing the innovation one should take these measures: appoint a manager of the group for realizing the innovation and completely relieve him of other duties; form a temporary target group; and also introduce into the official duties of a large group of workers additional functions related to the realization of the given innovation. Undoubtedly, in this case the people participating in the realization of the innovation should be accordingly relieved of some of their basic work.

The problem of controlling innovations is complex, multiplanar and comprehensive, and it involves the activity of the majority of subdivisions of the enterprise. Therefore it cannot be resolved without the full support and the direct participation of the highest unit of the management organization. The psychological aspect is also important here--the outcome of the inevitable opposition between proponents and opponents of the innovation is frequently determined by the position of the management. If it is negative or indifferent the innovation has little chance of surviving.

If the task of increasing the innovation potential is entrusted to a manager of one of the functional subdivisions of the organization it will hardly be possible to count on success since each of them has his own particular functional limitations. But even the creation of special target program structures, in our opinion, does not always contribute to increasing the innovation potential. In such cases there is some point in turning to outside consultants for assistance.

One should especially emphasize the fact that the consultants, working with a broad range of organizations, can accumulate the necessary experience and develop the most effective devices for solving a given problem. Also extremely important here is the subjective factor, which is related to the appearance in the organization of a person from the outside who has the authority of a specialist in a certain area of activity. It should also be noted that the independent status and the fresh view of the consultant make it possible for him to see for himself and show the management of the organization problems which they have not yet addressed whose existence is taken for granted.

The participation of a consultant in raising the innovation level of the client organization can vary within a broad range. It can be reduced to making certain recommendations for realizing the given process or, on the contrary, the consultant can be actively involved in all phases of the change of the innovation level.

As for the selection of a concrete consultation model, in our opinion, this should be determined by indicators of the condition of the system for which consultation is being received, the most important of which is the psychological climate in the collective and especially the level of the innovation "mood"--the orientation of the personnel toward changes, ability to communicate, the existence of a developed network of horizontal ties, and so on.

The selection of an optimal model for consulting depends on the level of the innovation attitude in the organization. In practice there is a certain minimum level of innovation receptivity below which no effective consultants produce no results. In such a situation many consultants inevitably refuse to do the work while others agree, but only under the condition that it must be preceded by a preparatory stage during the course of which the psychological climate is improved and the "innovative spirit" of the collective is raised.

The most acceptable model of organizational development in this situation turns out to be the one which assumes that the consultants in conjunction with personnel of the enterprise will conduct measures directed toward consolidating the collective, improving communications, revealing existing conflicts, and increasing the mutual understanding among the divisions and sections. The consultants have a broad range of instruments at their disposal for conducting this work, including situation games, directed discussions, confrontational conferences and so forth.

One must take note of the interesting experience accumulated by a number of Soviet research consultants, mainly G. P. Schedrovitsky and A. I. Prigozhin in the utilization of game methods to solve complex problems associated with the psychological climate. As a rule, the game takes from 7 to 20 days and all the key personnel participate in it, along with the group of researchers from outside organizations who are leading the games. The results that have been achieved show the effectiveness of this method.

When a particular level of innovation enthusiasm has been reached it becomes possible to use the model "cooperation." It is realized through the creation of joint working groups which include consultants and representatives of various subdivisions of the organization receiving the consulting, mainly those where the most important changes are envisioned. These groups conduct an entire complex of work beginning with situational diagnosis and ending with the formulation of a strategy for changes and work for retaining the personnel.

The main tasks carried out during the course of this work can be reduced to the following:

revealing short-term and long-term innovation tasks of the given enterprise or its subdivisions;

describing and ranking the planned and potential innovations (according to types, directions, radical nature, degree of localization, resources required for introduction, and so forth);

localizing innovation zones and finding their innovation potential;

determining the needs and the directions for increasing the potential of innovation zones and the organization as a whole;

forming the strategy and plan of measures to raise the innovation potential;

creating and formalizing innovation structures for practical implementation of the earmarked plan.

The degree of participation of the consultant changes depending on the stage of the consultation cycle, being gradually reduced and completely eliminated only upon completion of the stage of the fixation of the changes. An important indicator of the effectiveness of the activity of consultants is the degree to which they end up in a condition to make the organization ready for changes and create a "support" network from out of its workers, having trained them in methods of diagnosis and realization of changes. The goal is reached if in the future the organization is in a condition to solve similar problems without resorting to assistance from consultants.

The previously popular model of "doctor--patient" which consists in having the consultants work independently in the organization and submit to the management the corresponding report with recommendations, is used extremely rarely at the present time. The reason is that more than 80 percent of these reports are not realized in practice. Life has suggested that this model does not make it possible to compensate for two important negative aspects that are associated with the activity of outside consultants. The first aspect is the impossibility of having a clear idea of the organization over a short period of performance of the work. The second is linked to the psychology with which personnel of the organization accept recommendations: people are unwilling to agree to the introduction of recommendations which have been developed without their active participation.

In conclusion I should like to emphasize that the task of increasing the innovation potential of an organization is one of the most important ones at the present time. And at the same time it is exceptionally complicated. This work requires a professional approach, which can be provided on the path to forming an institute of professional management consultants, accelerating the development of the theory of innovations, and forming a net of diagnostic instruments both for general situational diagnostics and for discovering the innovation level of the condition of various organizational subsystems.

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## RANGE OF UNDERGROUND WORK DESCRIBED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 130-140

[Article by P. K. Savorskiy, director of the Krivoy Rog Ore Administration imeni F. E. Dzerzhinskiy, V. M. Kobets, candidate of economic sciences, Belgorod Cooperative Institute, and N. A. Kholodkov, candidate of agricultural sciences, Dnepropetrovsk Agricultural Institute: "Raising Vegetables in Mine Workings"]

[Text] Mankind has traveled a long path in the assimilation of underground spaces: from the utilization of natural caves, dugouts and cells cut into cliffs to extremely large enterprises equipped with the last word in technical equipment. What causes man to dig underground? There are various reasons, but all of them, in our opinion, can be reduced to one--the desire to provide normal living conditions. Even today in certain regions of the world underground housing is considered better from the standpoint of supporting life. For example, the Berber tribes in the south of Tunisia construct their own villages (with 1,000 residents each) only underground. The constant temperature within the housing makes it possible to counteract the intolerable heat in the Sahara during the summer and the icy winds in the winter. In the middle of the century in Turkey they built entire cities underground. Some of them had 2-10 underground floors! The population of the underground city in the region of Capadocia reached 60,000 people.

Today underground workings are adapted to store archives, petroleum products, perishables and material values (for example, the Banc de France stores the country's gold supply in specially equipped underground premises).

In the little village of Velichka (near Krakow) the salt mines are used for tourist purposes, and in the used chambers of the mines there is a large mountain museum, a dance hall, sports facilities and a church. In 1984 they opened a small sanatorium there for treating patients with bronchial asthma. In the Giscone of the depleted salt mines contains an enterprise for producing liqueurs. Since 1972 in the city of Odda (Norway) they have been operating an underground sports arena with an area of 1,100 square meters. An underground stadium has been operating since 1968 on the bases of salt mines of the

villages of Sverdlovsk in Trans-Siberian railroad. The tanks for the patients are located at a depth of 200 and 300 meters. Similar underground hospitals have been opened near Tver and Tcheljabinsk.

The primary organizations of Russia have developed a plan for the utilization of underground space in the capital. They will locate underground not only utilities, but also warehouses, stores, subway stations, archives, telephone exchanges, medical services, educational enterprises and trade institutions. Most of this plan has already been implemented. Few purchasers in the stores or department stores, it must be noted, are brought to them along specially underground "tunnels" which a smaller tunnel that is 200 meters long goes up to the noted roads.

Fruits and vegetables are stored in the Soviet industrial cities of Pskov and in underground cellars over the village of Sver in Gorlychay Rayon in Georgia, Kirov, Voronezh and other cities of the Union. It is a common phenomenon underground.

City builders think that in three years about 70 percent of all the garages, 60 percent of the warehouses, 30 percent of the cultural and domestic institutions, 20 percent of the industrial enterprises, 10 percent of the municipal enterprises and 10 percent of the administrative buildings will be located in underground works.<sup>1</sup> However, it is reported that vegetables are raised in them.

#### Is This Not a Fantasy?

Even those greater school such as we have only partially a truth: earth and sun are necessary to grow plants. Whether one exists at great depth, do not convince the sceptics: although these structures are artificial, they are located on earth and under the sun (the roofs of the hothouses are transparent).

In the laboratory for light physiology and food culture of plants of the Agrobiology Scientific Research Institute, in the light installations of Professor A. N. Tsvetkov they have recorded a yield of tomatoes of 180 kilograms per square meter. The effect is impressive if one takes into account that productivity in the hothouse counts to 10 to 20 kilograms per square meter, and on open ground--1 kilogram per square meter. The results of this research also prompted specialists to think of the possibility of raising plants under the conditions of mining works which at first glance do not have at all natural--natural light.

Today underground crop growing has already taken the first steps. Let us turn to the facts. Workers of the Polar-Alpine Botanical Garden (Institute of the Kola Branch of the USSR Academy of Sciences) under the underground conditions of the Kuznetskay Mine in Kurnayev village at a depth of 600 meters are raising chives, onions, catalpines and other flowers. American specialists are raising pines and fir seedlings in standard sizes at a depth of 1,250 meters. An average of 25 percent of the seedlings die (on the surface this figure is

half this amount) and this is a very difficultly assimilated. Residential houses are almost a natural environment for mushrooms. They do not need moisture, since they are among the lower plants that have no connection with the earth. A mushroom farm in the world was created in the Arctic. In the northern hemisphere. The workings of an old lime mine 1,500 meters below the surface of the earth have 24 kilometers there. They produce more than 6,000 tons of mushrooms a year. In France, 98 percent of all the mushrooms used for food are grown in the mines near Paris. In the USSR mushrooms are raised in the Gremi catenary. For these purposes they have adapted old mine workings not far from Bishkek, and it is assumed that the annual production of mushrooms in the USSR must 5,000 tons in the future. And so the first experimental mushroom farms.

But again--why is all this necessary?

The need for using underground space as a while for the following industry has already discussed at the beginning of the article. The final point in this matter is given by the law "On Establishing the Basis of Legalization of the USSR and the Union Republics Concerning the Depths of the Earth" (1975). It has a section devoted to the utilization of underground workings that are not involved in the extraction of minerals which requires that every opportunity be taken to free the surface of the land from structures which do not have to be on the surface.

Increasing the production of vegetables in the life of the population. Under the agriculture which was earmarked by the Food Program. The majority of vegetable crops cannot be stored for a long period of time. As a result of this such vegetables that are valuable to man as carrots, tomatoes, onions, green onions, fennel, pepper and lettuce are sold mainly during the short summer period. Raising vegetables in protected ground which has become widespread in recent years far from satisfies the needs of the population and it does not eliminate the problem of availability. Provided that the area of protected ground each year we harvest an average of about 1 million tons of vegetables (up to 5 percent of the overall harvest) or 3.5 kilograms per capita. Of this quantity, which is inadequate to begin with during the winter period the consumer receives only 0.5-1 kilograms. For example, in winter hothouses of the steppe zone of the Ukraine 75 percent of the overall crop of cucumbers comes in April-June and 71 percent of the tomatoes--in May, October and November. Consequently, as a rule, they make their way to trade and public catering enterprises not long before they begin to ripen in the open ground (the reasons for this will be discussed somewhat later). Moreover the Ukraine is among those zones of the country (Center, South) which have the most favorable conditions for raising vegetables on covered and open ground.

What Will Change With the Utilization of Underground Workings?

To answer this question we should have the results of many years' labor of scientific research of the Prepprofektural Agricultural Economics. This research was started at the Gigant-Glubokaya Mine of the Turkestan Mining Administration ineni Dzerzhinsky (it subsequently extended to other mines in various regions of the country).

In the cross-cut of the Gigant-Glubokaya Mine at a depth of 100 meters they constructed two underground hothouses. "It is good that you have hothouses to grow some crop. But in general can these vegetables be used for food?"--was the typical question of skeptics. The first results surprised even our own expectations. "Cucumbers raised underground in terms of their shape and the size of the fruit are no different from ordinary ones, and their juice is uniform, green and more intense, and their aroma is stronger. The soft part is firm with numerous small underdeveloped watery soft seeds. There are no holes inside, the taste is distinct and pleasant, and the skin around the seeds is not noticed when they are chewed. The tomatoes are distinguished by an intense, typical color and the correct shape, and there are no cracks or blemishes on the surface of the fruit. The taste is quite distinct and pleasant, and the consistency is dense. The size of the ripe fruit around the diameter is 6-9 centimeters. There is reason to think that tomatoes raised underground have increased storage potential and they can be shipped over long distances"--this is an excerpt from the commercial description of underground products.

And now let us give the results of the official chemical analysis. The nutritive value of tomatoes and cucumbers is basically conditioned by the existence of sugars in them. There were 16% of them in the underground tomatoes than in tomatoes raised on the open ground and in hothouses, but the underground cucumbers were sharply superior (see Table 1).

Table 1--Sugar Content in Tomatoes and Cucumbers Raised Under Various Conditions

Vegetables	Open Ground	Hothouses	Mine workings
Tomatoes	2.5	2.6	1.7
Cucumbers	2.2	1.9	4.5

In the tomatoes raised underground there turned out to be an average of 11 mg/% of vitamin C (on a traditional field--42 mg/%); in the "underground" cucumbers it was 70 mg/%, which is a 14-fold increase over the content of this vitamin in ordinary cucumbers, in large onions--7-fold, carrots--5.5-fold, and lemons--1.8 fold. And this means that with mass raising of vegetables in mines they can become one of the main sources of vitamin C during the winter.

Thus vegetables raised in mines in terms of their qualities are not only as good as vegetables raised under ordinary conditions, but in terms of certain indicators even surpass them. This is related to the fact that in mine workings at great depths the conditions for growing plants are considerably better than those on the surface: a stable temperature throughout the entire course of the growing period, a high atmospheric pressure, increased content of carbon dioxide in the air and artificially created special lighting conditions.

#### Economically Advantageous

Raising vegetables underground is considerably more effective than in surface hothouses--we came to this conclusion by comparing the results with the

indicators of the Dnipro-Donets Combine which has 45,000 square meters of winter hothouses (see Table 2).

Table 2—Productivity and Production Cost of Vegetables

Vegetables	Productivity, kg/m <sup>2</sup>		Production cost, rubles/kg	
	Winter Hothouses	Underground Plots	Winter Hothouses	Underground Plots
Cucumbers	17.5	60.0	0.91	0.70
Tomatoes	12.7	35.0	0.93	1.42

There is the widespread opinion that in underground conditions with the most complete darkness the expenditure of electric energy is so great that it practically does not make sense to produce vegetables. Herein lies one of the reasons for the excessively restrained attitude of economic leaders toward the introduction of underground vegetable raising. Let us turn to the figures. Every 1 square meter of underground plantations requires during the course of the year, according to our calculations, 3,960 kilowatt-hours of electric energy (or 39.6 rubles). In order to obtain 1 kilogram of tomatoes over here an average of 123.4 kilowatt hours (1.22 rubles) and cucumbers—40 kilowatt hours (0.6 rubles). That is, the expenditures of electric energy actually are great.

But is it possible to do without large expenditures of electric energy in winter hothouses?

As a rule tomatoes and cucumbers are not for sale in the winter. Why? It is economically disadvantageous to produce them at this time since there is not enough natural light or heat. As a result, expenditures on artificial lighting and heating increase. For normal growth of vegetables within the hothouse it is necessary to have a constant temperature of +18-22 degrees. Even under the conditions of the relatively warm climate of the Ukraine, in order to heat 1 square meter of winter hothouses it is necessary annually to expend, according to the data of V. N. Gryzenkov, 215 kilograms of coal, 96.4 cubic meters of gas, 678 kilowatt hours of electric energy and 2.5 tons of steam (underground plantations are heated mainly from the natural heat of the earth). Therefore the managers of farms are trying to shift the raising of vegetables to the period when the daylight hours are fairly long and the air becomes warmer. And so it turns out that hothouse vegetables are only slightly earlier than their "brothers" from the open ground.

Each kilogram of vegetables raised in mines provides 84 kopecks in profit, and in winter hothouses--only 41 kopecks. The profit from operating 1 square meter of underground hothouses is much greater than that of surface winter hothouses: 39.9 and 6.2 rubles per year, respectively. Expenditures on the construction of underground plantations are recouped in the first year of operation, and winter hothouses--after 11.6 years. The profitability (in terms of the production cost) of vegetables raised in underground workings is 87.5 percent, and in winter hothouses--44.6 percent.

The creation of 1 hectare meter of glassed-in winter hothouses and glass hothouses costs 74.2 rubles, block spring vegetable hothouses—70.0 rubles, plastic—34.5 rubles, and mine workings—18.0 rubles. And in zones with a cold climate, for winter hothouses these figures increase to 100 rubles per square meter while in underground structures they are not more than 10. Corresponding increases in expenditures on operating the glass and plastic hothouses as well. In many cases (and not only in regions with severe climatic conditions) capital investments on the construction of winter hothouses are not recouped with the profit that is obtained.

The advantages of raising agricultural crops underground are also manifested in the savings on cement, glass, metal and various kinds of equipment. For example, to create a hothouse combine with an area of 6 hectares takes about 700 tons of metal, more than 40 carloads of glass, water heating, heating and so forth. The glass and heating equipment are not required for underground hothouses and the need for metal is minimal.

Because of the specific conditions of the protected ground (the uniformity of the crops that are raised, the large quantity of fertilizers that are applied, the increased moisture content of the soil and so forth) the structure of the soil is violated and the plants become ill. Therefore, the soil in hothouses has to be changed once every 3-4 years. This involves large expenditures of time and money. Under the conditions of mine workings these difficulties increase many times over. Let us recall that we are speaking about utilizing mine workings mainly in existing mines in which the areas for gardens are mainly for extracting ore and not raising vegetables. In this situation, a solution has been found--this is to use small hydroponic beds in the mines where all the quartz or silicon gravel (with particle size of 0-20 millimeters) can be used for 15 years without being replaced. Trays for hydroponic growing can be manufactured out of reinforced concrete and plastic stretched along asbestos cement pipes with a large diameter. The water and mineral fertilizers are applied automatically.

Under natural conditions for a certain part of the day the growth of the plants is retarded because of the change in the temperature and light conditions, especially during the winter. We experimentally established an optimal light "day" in the mine for cucumbers--10 hours, and for tomatoes--12 hours, with an overall length of the "day" of 18 hours. As a result, the cucumber seedlings are ready to plant in 15-20 days, and in winter hothouses—35 days, and the crop is harvested after 80-85 days and 100-110 days, respectively. Thus in the underground workings 10-15 days are saved with the seedlings and 1-25 days with the ripe fruit. Approximately the same results have been obtained for other vegetable crops.

In the winter hothouses of Dnepropetrovsk Oblast cucumbers are raised from March through July and from September through November, and tomatoes—from April through July and from October through December. For 4 months of the year the area of covered ground produces no crop. The mine workings can be used year-round, and here it is possible to have not two but four or five crop turnovers. This peculiarity of underground hothouses is especially important for the northern regions. There is a real possibility of eliminating the seasonal nature in the production and consumption of vegetables.

In other words, in winter hothouses and underground workings the shortcoming are approximately the same, but the advantages of the latter, in our opinion, are beyond competition.

#### How Many Underground Plantations Are There and How Many Are Needed?

Unfortunately there are no complete statistics about the number of exhausted underground workings. We should give selective working figures which are at our disposal. At various depths right in Krivoy Rog there are about 500 hectares of workings which in a short period of time could be adapted for raising vegetables: in the Tashtagol'skoye Mining Administration (Kemerovo Oblast) there are more than 35 hectares of them; there are about 30 hectares of abandoned gypsum mines at the Pustolanskiy Gypsum Combine in Arzamas (Gorkiy Oblast).

How many of them are needed in order to provide the population with vegetables based on the norm for consumption of 143 kilograms per person per year? According to our calculations, in zones with unfavorable climatic conditions it will be necessary to have per capita for raising cucumbers 0.1-0.13 square meters, tomatoes--0.4-0.5, and large onions, sorrel and other green crops--0.15-0.23 square meters, or a total of 0.6-0.9 square meters. This means that in order to provide a city with 100,000 people with fresh vegetables for a year it would be enough to have 6-9 hectares of underground territory.

Even taking into account the incomplete information available about the quantity of free underground workings which we have given, it is obvious that the method we have proposed is realistic. Underground territories could supply fresh vegetables not only for the population of the zone where they are located, but also for adjacent zones that are not associated with the mining of minerals by the underground method.

Borrowing the experience of Krivoy Rog, underground hothouses have already been constructed in other regions of the country. But they are opened and operated on an independent basis, mainly on the initiative of individual managers. It is time for the results of the experiment to be verified centrally for viability in various regions of the country, including in zones with permanent frost, since even there the temperature is above zero at great depths.

The possibility of modeling the climate of practically any zone of the earth in underground workings opens up unlimited possibilities for practical crop growing. Cucumbers and tomatoes are only the first of the products of vegetative origin for which underground technology has already been developed. It is quite realistic to think about mass production of citrus fruits underground in zones with permanent frost. Underground workings can also be adapted for raising medicinal plants--grasses and bushes. This will make it possible to stop importing from abroad the vegetable raw material necessary for manufacturing domestic medicinal preparations. Moreover, it will be possible to produce them and deliver them to foreign firms.

Of course in order to introduce these recommendations into practice it is necessary to conduct additional research. As concerns underground production of vegetables, active introduction of this method is possible already.

In our opinion, there can be no doubt about how timely this approach is. Underground hothouses should become a constituent part of the agroindustrial complexes and make their contribution to the USSR Food Program. Of course, on a statewide scale it will still be necessary to solve many technical, organizational, legislative and other problems. Perhaps there is some point in organizing it under the USSR Council of Ministers or the USSR State Committee for Science and Technology and Interdepartmental Council for the Utilization of Underground Areas for the Needs of the National Economy.

#### FOOTNOTE

1. Shevtsov, P. F. and Zilberbord, A. F., "Pod zemlyu, chtoby sberечь землю!" [Under the Land in Order To Save the Land], "Nauka", 1983, p 98.

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## OPERATION OF URBAN PASSENGER TRANSPORTATION DISCUSSED

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMYSHLENOGO PROIZVODSTVA (EOP) in Russian No 7, Jul 86 pp 141-152

[Article by Aleksandr Yuferev, journalist (Moscow): "Wheels, the Tide and the General Condition"]

[Text] In my files I have an angry letter from an engineer from Kalingrad, A. Kolesnikov. It contains these lines: "Just look at what is being done in the buses. It is like a bazaar! It is all a bustle, they make you put your money in there, get a ticket from here, collect the change. Is it not time to put an end to this?...."

What answer did he receive? That the ticket is essentially a certificate of the honesty of the passenger? After all, the ticket has no other function in a city bus, streetcar, trolley or suburban electric train. It is a different matter on a train that travels a long distance, a theater, a movie or an aircraft. There at least there is a place to show it. For one person it is a little more expensive, in a roquette or a deluxe car, for another it is a little less expensive--in the balcony, in the third circle or a reserved seat. But in the bus it is like a shield to repulse an attack from the controller: here, you can see that I am not a thief.... Should one or can one suspect every single person of dishonesty? But they must be suspected or why would a ticket be needed!

So now I can answer the engineer in public: You are right, Comrade Kolesnikov, we must put an end to this self-flagellation with tickets. Today we have experience in how to do this.

This was first thought of in Tbilisi, where until recently there were at least as many people without tickets as in Kalingrad, and sometimes even more. Even now, not on all but on certain routes there are no tickets, and there are neither controllers nor...rabbits. But the cashier booths are still there. But much more money is collected in them now than before.

We should not suspect everyone of dishonesty, they decided in Tbilisi, let us create conditions whereby one cannot be dishonest because it is impossible. By means that made it possible to get rid of the nervous strain with tickets, in Tbilisi they began cost-accounting. As a rule, this is discussed as an

economic category. In this case, one could clearly see its social functions, and both for the transportation workers and for those who take advantage of their services--the passengers.

The transportation situation in Tbilisi has been aggravated for many years. The matter reached a point where on certain busy lines the time spent waiting for buses exceeded 40 minutes. All known local measures were tried: optimization of the routes, changing the time of the beginning of operation of enterprises and institutions, television means of dispatcher control. But nonetheless the buses, streetcars, trolleys, and taxis were taken by storm by the passengers and a great deal was lost in these battles. Just so they didn't lose their heads.

More than one poor dispatcher has ended up in the hospital because he was not able to explain convincingly to the passengers why it took so long for the streetcar to come. And how does one explain this? The streetcar was not there for a long time because there was no money to repair or maintain it: the streetcar ticket machine was empty.... Because it was empty the streetcars took so long! answer the passengers. What kind of mutual politeness can there be here?

Everyone looked for his own way out of the crisis. Some suggested that as a decisive step they add a certain number of police posts. Others suggested that they increase the sum of the state subsidy (as though the state had extra policemen or extra millions). Still others suggested introducing a transportation tax. Regarding the transportation tax, to all who wished to discuss this subject the chief of the Tbilisi Passenger Transportation Association, Robert Nikuradze, answered a question with a question: But why not begin with a food tax? How convenient and simple: you subtract the same amount from everybody's wages and just throw the doors to the grocery stores open! Run in, grab what you want, everything is paid for! Nikuradze was openly malicious. Indeed, who would have such an idea? But when it comes to buses and streetcars and trolleys, they do have it.

Both in EKO and in other publications this idea has been discussed in various variants. Quite recently, in December of last year, in LITERATURNAYA GAZETA a respected scholar made a suggestion to introduce advanced payment for passage. In two words this amounts to a situation where all citizens, voluntarily but necessarily on payday pay for their transportation to work and back in advance for the following month. And then they can ride or not. These same people who do not receive wages, housewives, for example, should not be required to pay the transportation advance, according to the scholar. But perhaps they should be sent to the savings bank on a particular day. Let them stand in line and pay for the bus as they do for the apartment.

The transportation tax does not become more attractive because it is disguised in different clothing. The main thing from which it does not save us is the disease that has affected both cargo and public transportation--exaggerated accounts of the volumes of work that is done. Money does come into the accounts of the transportation organizations, but whether or not they make the necessary number of trips or maintain the required intervals between them is another question. Who checks on this--the gorispolkom? But through what

forces? The transportation workers themselves? This is doubtful.... Everyone knows what intradepartmental control means. Nobody is going to stick his own neck out.

Perhaps it was this that they were reacting against in Tbilisi when they developed their experiment. At least Nikuradze did not ask either for policemen or for millions. Incidentally he did not ask for buses either. He asked for the smallest thing: to make it possible for the drivers themselves to take charge. Those people who, in the opinion of the passengers, are responsible for all the problems.

Put yourself in their place and look from within the problem--Nikuradze persuaded the skeptics. "We run around in a circle with our tongues hanging out: the passengers do not pay us enough because we are working poorly, and we are working poorly because the passengers do not pay us enough. The less money there is in the cash boxes the fewer buses there are on the line. The fewer buses, the less money. In order to turn things around it is necessary to stop first and find a support point."

"What kind of support point is there in the drivers?" the opponents laughed. "You have found the people in charge!"

"True, now there is none: neither in the cells nor in the bus cash box," agreed the chief of the association. "I suggest giving them everything but making them completely responsible for it!"

...The result is always more convincing than words. The "bandits" turned out to be businesslike and took charge of the situation. And at the bus stops, an unheard-of thing!--at the bus stops where there had been unruly crowds at the peak hours there are now lines. People stand calmly, reading books. The bus comes up, the passengers without hurrying move toward the front door (it is precisely at the front door where all the focus is), they put their coins in the box and they sit down. When all of the seats are taken, the lines freezes for a second and the doorway is cleared. Perhaps someone is in a hurry and is willing to stand? Go ahead, nobody will object.

And so one can enter only through the front door and exit from the back. And now there is only one coin box in the bus, at the front door. There are no tickets, and, incidentally, no controllers either. It is not difficult for the driver to make sure that nobody slips through without paying, and, moreover, he has been given the right to change large denominations of money. Some people might think: This is a good place for theft! But the transportation workers of the Georgian capital have managed to arrange things so that not a single kopeck disappears from the cash box! First of all to do this they carefully studied passenger flows for months: for the various days, hours of the day, weekdays, days off, holidays, even times of the year. And all this was to find out the real number of passengers transported and the possible real earnings. Moreover, the experiment was started on routes that go from the subway stations to the microrayons: where the passenger flows have stabilized.

thus now in Tbilisi, because of the system of payment without tickets and without coupons, they collect 100 percent of the earnings. One must say that approximately the same path was taken by transportation workers of Jurmala and a number of other cities of Latvia. Only here the driver, when letting the passengers through the front door, punches their subscription coupons. The half-measure of a solution led to a half a success. They do not have people without tickets here, but they still have coupons and tons of paper are expended in vain to produce certificates of passenger honesty which are not necessary to anyone. Moreover, one can add to the losses the wage fund of those who sell these coupons. It seems that the consumers also lose.... probably not all of the coupons purchased by people staying at health resorts are used. But the transportation office receives all of the money for services that have not been rendered.

The Tbilisi transportation workers took the 100 percent collection of earnings for the work that had been done as a point of reporting for the introduction of cost accounting [khozraschet]. For each percentage point by which the brigade of drivers failed to fulfill the monthly plan for income from transportation, the amount of the brigade's fund intended for wages is reduced by 3 percent. But for the driver who has overfulfilled the plan for collecting earnings, for each percentage of overfulfillment the wages are increased.

The organizers of the experiment have also thought about this situation: in order to get a little more money in the cash box, each driver will try to be the first to pull up to a stop where many passengers have accumulated. As a result, some places may be empty (without buses) and some places may be crowded.... Therefore this provision has been established: for every percentage point by which the driver has reduced the regularity of movement, his earnings will be reduced by an equal number of percentage points. Moreover his poor work will be reflected in the indicators of the entire brigade. And the wages of his comrades will also decrease. As a result, even the brigades that had become the first authorized masters of the routes immediately began to fulfill their movement schedule by more than 98 percent. And this is not to their credit alone. The passengers would have cursed the drivers for inconvenience were it not for one detail: the fact that the repair workers are now vitally interested in making sure that the people do not have to wait so long for buses.

Previously they had nothing to do with this. Now the wages of the repair workers are essentially paid by the drivers. If a bus that is in good repair has traveled a required number of kilometers the repair workers receive an additional payment, and if they have economized on spare parts they receive even more. If they have not met the requirement they have reason to be sad. Thus while previously the average wages of repair workers amounted to 255 rubles, now they are 386, and no one has cause to complain. The master of the routes has also taken responsibility for the bookkeeper. He is paid twice as much as before, but you yourself understand that he is more responsible for his work.

Careless drivers are threatened with sanctions which can have a very bad effect on their budget in the event of violations. If an unrepainted bus

leaves the garage, for each trip the monthly earnings are reduced by 1 percent, and if this is discovered on the line--by 3 percent. If a dirty vehicle has left the garage, at the end of the month for each case the earnings are reduced by a half percent, and if this is discovered on the route--by 1 percent. If violations of technical safety or the rules of traffic have been violated or if there are more passengers in the bus than there should be, the earnings are 3 percent less. If a driver has been rude to the passengers his earnings are reduced by 5 percent. Moreover, if there have been more than two violations in a month involving the application of sanctions, they have to leave the route altogether.

This is all discussed in the agreement concluded by the brigade of drivers serving the route and the administration of public transportation enterprises in Tbilisi. There are many curious innovations in this document. For example, the brigade does not have a guaranteed wage. The fund is formed from the difference between the incomes from transporting passengers and the expenditures on this. The brigade council distributes that wages among the members of the brigade. If the brigade has used too much fuel, tires or spare parts, the limit on their expenditures for the following month is reduced by the amount of the overexpenditure.

The duties of the enterprise include planning the assignments for the brigade for the month and for each driver each day, and this is done individually for work days, days off and holidays, and they must also provide for continuous supply of material resources. The following responsibility is also stipulated. For idle time because of a lack, for example, of fuel or spare parts. In this case the enterprise pays a penalty to the brigade calculated on the basis of each hour of idle time of the vehicle. As a result, the average wages of the drivers from the brigades that service express routes are somewhat more than for drivers of streetcars, trolleys and ordinary buses.

Moreover, in some places they are now suggesting doing away with coin boxes in the buses altogether. For example, the Georgian Ministry of Automotive Transportation in Rustavi plans to equip the bus stops with automatic control points and distribute the automatic machines in approximately the same way as this is done in subway stations. This is an even more progressive step. The driver will be completely relieved of concerns about gathering his earnings, but the responsibility of the entire brigade that services the route will increase.

Now a concern about something else. How does one change a whole passenger automotive administration over to complete, real cost accounting? What should the agreement be which is concluded between the enterprise and the association? Who will be authorized to sign it? The Council of Brigades of the Automotive Enterprise or the director as the representative of the administration? It is not easy to find answers even to these most simple question. Science could help: legal experts and economists. But so far they prefer to keep apart from the experiment.

One thing is clear: in Tbilisi they have managed in reality to use many of the reserves that have been concealed up to this point. These include self-management of labor collectives and increased responsibility both of the

administration and of the immediate workers for the quantity and quality of labor, and real control with a rule from below to above.

What next? It is difficult to say at what rates things will proceed. It took a year to arrange cost accounting in the brigades of Tbilisi bus drivers. One of the enterprises is just now changing over to complete cost accounting. Robert Nikuradze introduced modern methods of management energetically and self-sacrificingly. Now he is no longer there. About such sad situations they say: the person burned out in his work. There is no doubt that a monument will be raised to him. For a person who has set in motion the bulky and cumbersome mass of outdated methods of management in public transportation the best monument will be worthy completion of what he has started. A passenger transportation association on complete cost accounting is a dream of specialists and a dream of passengers. Now everybody knows the advantages of this. On both the social and economic planes.

Now it is time for the experiment to be taken up not only by the Ministry of Automotive Transportation or the Ministry of Housing and Municipal Services, which have jurisdiction over streetcars and trolleys in many republics, but also other departments. The stumbling stone in many cases is the position of the USSR Ministry of Finance, which itself produces nothing (except instructions) but has great rights to "stop things." Where and how all of us are to proceed, how to manage, what economic policy to conduct--they know about all this in the Ministry of Finance and they judge it all from their tower.

At one time I had occasion to write about how the Finance Ministry workers prohibited an experiment in public transportation in Taganrog. There they decided to hold a lottery of ticket numbers among the passengers. The calculations promised an excellent economic advantage. The sociologists had worked extremely well. Even the "dressing" under which the lottery was offered to the citizens demonstrated the good idea. Do not throw your tickets away after the trip--the organizers of the lottery suggested to the passengers --and the city will be cleaner. And those who work to make sure that the city remains clean will receive prizes at the end of the month.... But the city's cleanliness was a diversionary maneuver: it was necessary to achieve fulfillment of the financial plan. The regular collection of earnings made it impossible for the transportation workers to pay bonuses to the engineering and technical personnel. Earnings declined and people began to leave. And, as we know, it is difficult to find a good specialist who will work for low wages. The Ministry of Finance prohibited the product literally on the eve of the first drawing. And a little more than a year later they condescended to permit this, but not in Taganrog but in Tbilisi! Where is the logic?

Naturally, even with respect to the cost-accounting experiment of the Tbilisi workers the financial experts have shown themselves to be zealous opponents. In the opinion of workers of this department, finances are a delicate and fragile thing: if you move a single brick the entire foundation will collapse. But if you do not move it, how do you look for answers, with your eyes closed? The economics are not blind man's buff. A correct solution cannot be found blindly. Or should one refrain from searching and live with the old foundation, hoping that the cracks between the bricks that were not promptly

cemented by the builders will disappear of their own accord, and then the entire structure will remain and somehow will not collapse.

Why did they begin with improvement of production relations in Tbilisi? It would seem to be simpler and more traditional (although also more expensive) to rely on increasing productive forces. Having analyzed the situation and having traveled over half the country looking for answers, the association came to a stunning conclusion: as compared to others, the Tbilisi workers were among the poorest. The value of fixed capital per ruble of cost of rolling stock was 0.33, and on the average for the country this indicator was 1, while in Moscow it was equal to 1.25 and in Leningrad, 1.76!

It was clear that regardless of how energetic the efforts may have been it was barely possible to make up for what had been lost. And when could one expect a return? Yet the situation would not wait and its exacerbation could be programmed with a sufficient degree of reliability. It is known that for people who spend more than an hour on the road to work labor productivity is 2.5-4 percent less than for those who can get there in 30 minutes. For people over 30 years of age who spend more than an hour getting to the plant, construction site or institution, the number of days lost because of illness is 1.5 times greater than for those who live within 30 minutes of work; for workers 40-50 years of age this difference is 1.8-2 times greater. Such are the reserves for increasing labor productivity that lie simply in eliminating the backwardness of transportation. Understanding the urgency of the task, they began an experiment in Tbilisi. They themselves could only improve production relations, and hope that the Ministry of Finance and the State Committee for labor and social problems would notice (the latter, incidentally, actively supported these undertakings). And everything else was in the hands of the Gosplan. They decide who will receive and who already has enough. Regarding the Gosplan transportation workers tell a story which has already become anecdotal. Streetcars for the entire country are produced in Riga. The passengers of the Latvian capital ride in Czechoslovakian ones. Because the Gosplan will not allot them. Of course, Riga citizens are quite willing to take them, but it would be more logical to take another path: to demonstrate the prestige of the city's trademark by their own example.

It is difficult for the republic ministries of automotive transportation and ministries of housing and municipal services to defend their interests before the union gosplan. Undoubtedly, an essential role could be played by the creation of a unified union ministry of public transportation. And one can see a good deal of advantage in such a step. After all, public transportation is everywhere, but there is no one single agency in charge anywhere. And so everyone goes his own way. They all have their own plants and shops, and they all the same problem--a weak scientific and design base, or none at all. And what base there is comes from fares, and even then differ. There is nobody to order new technical equipment and firmly insist on getting what they need. For a long time the subways were under the local soviets. The underground railroads were switched over to the jurisdiction of the Ministry of Railways and things began to go better. Now there is another problem: the subway is in the hands of the railroad, and the streetcars and trolleys are under the ministries of housing and municipal services of the republics, while buses and taxis are under the ministries of automotive transportation, and the river

ferries are under the ministries of river fleets.... So who is responsible for the transportation situation in a large city? The ispolkom? Yes, it is responsible, but only halfway. Nobody will take complete responsibility. Neither the USSR Gosplan nor the USSR Ministry of the Automotive Industry feels completely responsible either. For the entire country, whether it be country or city, north or south, mountains or plains, they drive the same buses. And even they are hidden somewhere in the background of the pile of orders to the branch. And the priorities are clearly mixed up.

We receive a great deal of praise abroad, and we ourselves are proud of the development of our domestic public transportation. Even economically developed countries were behind us in the area of public transportation for a long time. Now the situation is changing. Having finally seen the evils of the mass use of automobiles, they have now begun to make up for lost time. And we have been striving to increase the production of individual automobiles. Let us take a simple example: hundreds of thousands of rubles were spent on the reconstruction of the AZLK for producing a new brand of passenger car, while only tens of thousands were spent on the reconstruction of the Likino Bus Plant, which produces the majority of city buses. And the creation of an entirely new bus production (following the example of the Tolyatti production of passenger cars or the KamaK production of trucks) has not even been suggested in the Ministry of Automotive Transportation. Is this not the reason why it has been a good 10 years since a new model of urban transportation has gone out from the plant onto the roads of the country? And wherever possible, the old workhorse LiAZ, which has become an anachronism on country and city roads, is being replaced by the Ikarus.

For a long time there were negotiations between operations workers and industrial workers concerning the creation of a special vehicle for taxis. One which would be comfortable for the driver and the passenger, and there would be room for baggage. There is no new taxi, and we do not know when there will be one. There is no bus for Central Asia nor for the north or Siberia, and there is no reliable transportation for the mountains. Is this not why it is becoming more and more difficult each year for transportation workers to find personnel to drive the buses? Their coworkers are already promising to put air conditioners in the cabs of the trucks.... But why bother with air when the design of the seat for the bus driver has practically not been changed during the past 20 years. And yet the conditions for the work and the load, both physical and psychological, have increased many times over.

I am convinced that we must make haste. Everyone must make haste: the passengers, those who transport them, and those who provide for and plan this transportation. It will be immeasurably more difficult to make up for what is lost than to do it now.

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CSO: 1820/199

## EUROPEAN EXPERIENCE IN LABOR PLACEMENT DESCRIBED

Novosibirsk EKONOMIKA I ORGANIZATSIIA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 153-162

[Article by N. G. Zakharova, Institute of Economics of the World Socialist System of the USSR Academy of Sciences (Moscow): "Labor Placement and Material Support for Released Workers in the European CEMA Countries"]

[Text] The intensification of production has also had an effect on the utilization of labor resources in the CEMA countries. There has been increased movement of the labor force because of the elimination of jobs where the utilization of the worker has been economically and socially unjustified; workers are released from certain sections of production and transferred to others where their production increases. All this has made it crucial to improve the socioeconomic mechanism for controlling the redistribution of the labor force. The European CEMA countries are gradually accumulating collective experience in this area, individual elements of which can be utilized when improving the system for redistribution of workers in our country.

The state territorial-branch distribution and redistribution of the labor force in the CEMA countries are done by special institutions for labor placement of the population that have been created under local agencies of authority. These are the Bureau for Labor Placement in Hungary; district divisions for labor placement in Poland; district state inspections for labor and social problems in Bulgaria; departments for labor placement in the GDR; and in Czechoslovakia the functions of labor placement agencies are performed directly by the national committees (local agencies of authority).

The majority of these agencies were created more than 20 years ago but they did not begin to play a significant role in the distribution and redistribution of the labor force until the middle of the 1970's in connection with the changeover of the CEMA countries to the intensive path of development. Today the main function of these agencies is to be the intermediary in labor placement between the worker and the enterprise. The goal of this mediation is to contribute to the establishment of labor relations that satisfy to the greatest degree the needs and demands of both parties. Labor placement agencies inform the population about vacant jobs and help to arrange work for them; they help economic organizations in providing

them with labor force; and they exercise control of the utilization of labor resources.

The concentration of functions for the distribution of labor resources in the hands of special state agencies makes it possible to give preference in providing labor force to branches of the economy and individual enterprises that are the most important from the national economic standpoint. For example, in Poland a number of priority enterprises have been singled out which enjoy various privileges in the selection of the labor force. In particular, they are permitted to select workers independently during a particular period, to conclude preliminary agreements with students in vocational and technical schools before their training is completed, and so forth. Czechoslovakia has also created conditions for preferential provision of labor force for the most important branches, regions and enterprises (for example, under the current five-year plan these include the coal industry and certain areas of capital investments). Priorities are established, as a rule, for a five-year period.

Labor placement agencies are also called upon to perform functions of information analysis consultation centers. Thus in Bulgaria the district inspection teams for labor analyze the condition of the occupational-skill structure of the labor collectives in the territorial cross-section and draw up a program for their development. In Hungary the staff of the labor placement bureau includes legal experts, economists and psychologists who consult with the population and enterprises that have information about the condition of labor resources in the country and the directions of the movement of the labor force. In Czechoslovakia and the GDR local labor agencies do not analyze the condition of labor resources or the dynamics or structure of employment of the population, but they are the ones that provide all of the initial information.

The collection and storage of information about the condition of labor resources and employment of the population require the application of the latest methods, including computers. The latter have already become quite widespread in the CEMA countries. Thus in Bulgaria information about people who have been placed in jobs comes into the computer center on the first of each month. As a result, there has been a considerable reduction of the amount of time necessary to place people in jobs: it now amounts to an average of 4-5 days. In the GDR labor placement agencies keep strict accounts of labor resources. Accounting cards are kept on all the workers living in the territory of the district. With the help of a card catalogue that is processed by a computer the labor placement departments quickly reveal skilled personnel and specialists who are not working in their specialty and offer them work in places where there is a shortage of them.

The role of labor placement agencies has increased especially in recent years. At the November (1982) Plenum of the BFP it was emphasized that local placement agencies are becoming a statewide system and they are being assigned functions of controlling labor in the districts, communities and enterprises. In almost all of the countries under consideration (Bulgaria, Hungary, the GDR and Poland--15 districts and FSR's) labor placement of the workers is done only or primarily through labor agencies.

In Czechoslovakia the national committees bear full responsibility for the distribution of the labor force in their region; they have the right to establish a limit on the number of workers; the enterprises can recruit labor force only with their permission. Labor placement in this country takes place on the basis of a "Unified System of Regulation of Employment and Distribution of Labor Force." This document is drawn up every 5 years, beginning with 1971. It envisions:

regulation of numbers of workers, ties between capital construction and labor resources;

priorities in providing labor force;

instruments of material incentives;

distribution of youth and graduates of secondary specialized training institutions and VUZes;

regulation of recruitment and distribution of labor force;

measures for stabilization of labor relations;

monitoring the employment of workers.

A most important task for labor placement agencies is to inform the population about vacancies and the needs for labor force according to sex, occupation and skills. The enterprises inform them of their vacancies and anticipated redistributions of labor force; the information that is gathered and analyzed goes back to the enterprises and the population is informed.

In Hungary and the GDR the enterprise must inform the labor placement agency 3 months before planned changes in the number of workers. The latter, in turn, informs the population about vacant jobs, and the enterprises--about unemployed workers and their skill, educational and sex and age structure.

All the European CEMA countries have adopted a single policy: concerning anticipated reorganization of production and redistribution of labor force the enterprises notify ahead of time not only the labor placement agencies but also the worker himself. The enterprise along with the agency must offer him no less than three places of employment that are close to the previous one in terms of the nature of the work and the amount of the earnings. In Hungary the worker can be fired from the enterprise if he refuses all three jobs that have been offered; in this case he is placed independently or through an employment agency.

Within the competence of the labor placement bureaus in Hungary and the GDR there are organizations for exchange of labor force among enterprises for particular periods of time, placement of seasonal workers and other special tasks in the sphere of labor. One more important function of labor placement agencies is informing the citizens about the possibilities of acquiring skills in a given region. Moreover, sometimes labor placement agencies themselves

organize occupational training of the labor force (for example, in middle-school graduates who have interrupted their training).

Labor placement agencies exercise control over efficient utilization of the labor force at enterprises and in certain cases they have the right to apply sanctions. In the GDR, for example, labor placement agencies have the right to send workers to other enterprises for temporary or permanent work and they can stop the hiring of new workers if an inspection has shown that the labor force already at the enterprise is not being utilized efficiently enough. In this case they take measures to limit surpluses of labor force and reduce turnover. In Czechoslovakia the national committees have the right to impose fines on the enterprises for exceeding the limit of the number of employees and violating other prescriptions. In Poland the enterprise is penalized with a fine if it has not notified the labor placement bureau about the existence of vacant positions or has given incorrect information about them.

The evolution of the functions of labor placement agencies in Hungary is interesting. For several years there has been a reduction of the demands of the branches of material production for labor force (see table). On this basis the country accelerated processes of redistribution of the labor force; they were accompanied by granting greater independence in hiring and firing. The functions of labor placement agencies also changed.

Table--Average Annual Rates of Increase (Reduction) of Personnel Employed in Hungary in Various Branches of the Material Sphere, %

Branches	1971-1975	1976-1980	1981-1982
Industry	0.2	-1.2	-7.7
Construction	2.8	0.6	2.1
Agriculture and forestry	-3.0	-0.8	-0.7
Transportation and communications	1.5	1.0	-0.3
Trade	2.6	1.2	0.8
Water management	2.8	2.3	0.2

In 1976 Hungary introduced mandatory enrollment of labor placement agencies in the distribution of the labor force. The enterprises were divided into three groups: those that were expanding production, those keeping at the same level, and those that were gradually curtailing. Only developing enterprises had the right to enlist new workers. This same purpose is served by the competitive system for filling openings that was introduced on 1 January 1977, which is mandatory for several categories of workers in most industries. According to the estimates of Hungarian economists, mandatory enrollment produced positive results: the needs for labor force of enterprises that were substantially increasing the number of employees were satisfied more fully; in certain areas there was a reduction of unjustified demands from the enterprises and a shifting of the labor force; and ties were created and strengthened between branch ministries and local agencies of authority--and this also contributed to efficient utilization of workers.

After there had been a change in the demand of the enterprises for labor force, its distribution began to be regulated in a different way. Beginning

in 1981 enterprises of Hungary were given an unlimited right to publish announcements of required labor force. The provisions concerning mandatory hiring of workers through local agencies were abolished, and now this happens only in exceptional cases. Additionally, the enterprises were permitted to publish information about jobs and the mandatory 3-year period for youth to work through distribution was abolished. As a result, labor turnover in the country increased and difficulties arose with the labor placement of certain categories of the population (people with partial disability, women with low qualifications, pensioners).

At the beginning of the 1980's in Hungary each year 1-2.5 million people or one-fifth of all the people employed in the national economy changed their jobs.

Because of the negative tendencies that arose in the part of initial distribution and redistribution of the labor force and also the expected expansion in the second half of the 1980's of the release and redistribution of labor force as a result of the introduction of new methods of national economic regulation in 1981, the role of local labor placement agencies for released workers was again increased, and enterprises were relieved of functions of this kind.

During the period of the establishment of the labor placement system in the other European CEMA countries its main task was to service a barrier on the path of increased demand of enterprises for labor force and to provide it to priority branches of the national economy. In the stage of changing over to a comprehensively intensive path of development of the economy, there arises the need to strengthen and develop such a function of the labor placement agencies as the placement of large contingents of workers who have been released from the sphere of material production. At the present time the system of labor placement of the population in the countries under consideration still cannot meet the new requirements fully, and in a number of cases this is an impediment on the path to releasing the labor force. Thus in the GDR and Czechoslovakia, where the level of development of the national economy makes it possible to reduce the need for labor force to the greatest degree in the sphere of material production, labor placement agencies, fully controlling the utilization of the labor force in the region, can prohibit the release of a worker if the enterprise if the enterprise cannot place him elsewhere.

The released labor force must not only be redistributed; it must also be retrained. As a rule, this is done by the hiring organization. In a number of countries assistance is given by the placement agency. Any redistribution and certainly retraining frequently involves material problems for the worker, particularly with possible losses in wages. Therefore in the other European CEMA countries decrees have been adopted concerning granting material assistance to workers during requalification and the payment of the difference in wages for a certain amount of time when changing over to a new job.

In Hungary if an enterprise is closed because it has been operating at a loss, courses for retraining are organized for the workers so that they can acquire a specialty necessary for a new place of employment. In this case a monetary stipend is paid to those whose labor relations are interrupted as a result of

organizations; regrouping of the labor force and who could not find another job in their previous specialty or position and therefore have agreed to undergo retraining. The stipend augments the wages of the worker in the new work position from the beginning of the new labor relations until the completion of retraining--up to the amount of the average earnings in the previous job; this is paid from 12 to 30 months, depending on the nature of the retraining. The enterprise that hired the worker pays the stipend.

In Czechoslovakia, when a worker is transferred to a new job, the following rules are in effect. If the released worker is immediately transferred to another enterprise, for 3 months he is paid the difference between his average earnings at the old and at the new jobs. The payment is made by the enterprise that has released the worker. Additionally, with the consent of the higher agency and the agreement of the local trade union committee, the enterprise can pay the worker severance pay in an amount of no more than 3 months average earnings. If after the transfer the worker performs work which requires retraining or education, the enterprise that has hired him must provide education and retraining. If even with assistance from the releasing enterprise and the rayon national committee, the worker cannot immediately find a job in keeping with his health, capabilities and training, he is given a stipend right up until the time he finds a new job. The stipend is paid by the rayon national committee for the past month. It can be paid to a worker who has submitted a request for labor placement and for the stipend. The stipend can be awarded temporarily to unemployed workers in Poland.

In the GDR when a worker is transferred one-time material assistance is rendered if he is transferred to a job with lower wages. The amount of this stipend is equal to the average sum of the envisioned reduction of the average wage. It is paid by the enterprise that releases the worker. Additionally, the enterprise pays the worker a monetary compensation when wages are reduced during a period of retraining or increasing qualifications.

In Bulgaria, if the enterprise cannot use the released workers according to their level of training, it can organize retraining for them. The time of training with leave from production is paid for and is included in labor tenure. Additionally, during the training there is a stipend that is paid on the basis of wages for the past month before release from work. In Bulgaria there are three variants of additional payments to the wages when a worker is transferred to a new job:

the workers that have been transferred to the new job work for 3 months with a lower output norm but with the same wages;

the workers that have been transferred to particular branches of material production (extraction of raw material, construction, metallurgy and so forth) during their first 4 months of work receive a payment in addition to their earnings which in the first month is 40 percent of the actual earnings, in the second month--30 percent, the third month--20 percent and the fourth month--10 percent;

workers and employees who have been transferred to a new job are paid the difference in wages between the new and old jobs for a year.

If a worker has been unable to find a job because of objective circumstances immediately after his release from work, for 1 or 2 months he is paid a stipend equal to his earnings in the last month before he was released.

Thus material difficulties are eliminated when transferring to a different job, and the worker is given incentive to increase his qualifications and acquire a new occupation.

As we can see, in the European CEE countries there is an active search for ways of improving the system of reeducation, requalification and material support for released workers. In all of the countries that have been considered except for Hungary and Poland the enterprises are not fully relieved of their responsibilities for placing the released labor force. Additionally, they bear responsibility for retraining and material support. But in recent years placement of the released labor force has been increasingly a function of state agencies.

The accelerated changeover of our country to the intensive path of development and the certification and streamlining of work positions strengthen the processes of releasing labor force. At the same time, the Bureau for Labor Placement is clearly not being adequately utilized. Even in Moscow, where there are bureaus in every region, the proportion of people placed through it in the overall number of those hired by enterprises in 1983 amounted to no more than 15 percent. It is necessary to make the system of labor placement unified for the entire state. Under these conditions it will be possible to transfer to the corresponding agencies the functions of labor placement of released workers, and then the enterprises will be able to materially support the released labor force. Labor placement agencies are beginning to play a greater role in supervising the utilization of labor force at enterprises and institutions--this supervision could contribute to combining local and state interests in the utilization of labor resources.

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CSO: 1820/199

## BOOK ON MANAGEMENT STYLE REVIEWED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 7, Jul 86 pp 179-188

[Review by B. V. Prilepskiy, candidate of economic sciences, of the book by Omarov, A. M., "Rukovoditel. Razmyshleniya o stile upravleniya" [The Manager. Reflections on the Style of Management], Moscow, Politizdat, 1984, 255 pp.

[Text] The manager.... What a precise concept.... What an indefinite concept.... Rather--what a large concept! This is probably why constant attention is drawn to research which focuses on management labor. One of these books came out in 1984. Let us say from the outset that it attracted our attention because it gathered together and generalized material that had been spread out among various publications, books, brochures and journals, and this is what managers need. Although, of course, we should like for it to have more original statements of problems.

### The Style of the Manager

This is determined by the individual peculiarities of the manager himself and the collective of which he is in charge. This assertion of A. M. Omarov is undoubtedly correct. The intellect and the general culture of the manager, his professional and ideological-political training, his character and his temperament decisively influence the results of the collective's activity.

From my experience in working as a foreman, a designer and a shop chief I can say that I always looked closely at the work of my immediate and higher managers. Each of them tried to organize the work of the collective in the best way and to achieve the goals set for the collective. But not all of them managed to achieve them. What was the matter? The problem is in the style of management and in the individual peculiarities of the manager.

At the beginning of the 1960's while working as a foreman in an assembly shop of an electrical mechanics plant I became an involuntary witness to the influence of management style on the work of the collective. The plant was headed by an energetic, technically knowledgeable, exceptionally capable, persistent director. Of course, working as foreman, I could not fully see and evaluate the director's style. The plant was large and there were many foremen. But I was the foreman in the assembly shop, a decisive (it seemed to

me) position. The director knew practically all of the foremen of sections where the fate of the plan was decided. Very frequently he visited our section, both alone and with the chiefs of the shop, production and other managers. He was interested in the details of the state of affairs, right down to the smallest thing--what parts were in short supply, what was the quality of the design documentation and technology. We liked this. It seemed that this was the only correct style for a manager. Sometimes the director would bring to the section components and parts that were in especially short supply. Seeing this kind of attitude and attention to the assembly work, we worked in the full sense of the word both day and night. But months and years passed, and things were never set straight at the plant. The production circulation held everyone back. The director held 5- and 6-hour conferences with the shop chiefs, figuring out all the details of the state of affairs at the plant. I became a deputy shop chief and frequently participated in these "planning sessions." People gradually began to get tired. After 5 years our director was transferred to another job and a different one was appointed for us. I was immediately surprised that during the first months of his work the new director appeared in our shop extremely rarely, only to study the peculiarities of the items that were produced and the technology. He was interested in how we arranged our work. According to our custom we tried to tell him about the shortage of parts and materials. I heard in response that he was the director and not the chief of the planning and dispatch bureau. We gradually saw that the head specialists of the plan (the head technologist, the head designer, the head metallurgist and others) no longer asked us the traditional questions about the shortage of parts. The specialists of the divisions were directing their efforts toward the technological level of the assembly and the reliability of the parts. And we began to feel that our work had become more uniform. The shortage of certain parts and the surplus of others began to smooth themselves out. The new director, like his predecessor, was distinguished by a great ability to work, energy and persistence. But they had different styles of management. The former had tried to do everything himself, to delve in everywhere, to get down to the details, as they say, infecting the collective with his energy. Other managers had worked according to the same system. They were interested in and worked on everything and anything. But the new director made everyone perform his own official duties first. Of course he did not manage to do this immediately. Many were offended that they were working, as it were, day and night, and the director scolded them for their inability to work, saying that they needed not work for the sake of work, but work in order to reach a concrete goal with the least possible expenditures. Nor was I immediately able to see the value of the director's style of work. Only after traveling the path of a shop chief, secretary of the party committee, and then having become his colleague (I was the director of the neighboring plant) did I understand how much the work style of the manager means.

We all study in the same Soviet VUZes, and we all have the same political platform and approximately equal occupational training--but very frequently the results of our activity vary. I agree with A. M. Omarov, that the most crucial problem for developing a manager is the development of his style, and therefore it is no accident that the book begins with the chapter entitled "The Style of the Manager."

Very important theoretical material is presented here and the close link between the style of management and the quality of administration is convincingly substantiated. A. M. Omarov's suggestions concerning delegating authority which follow from a correct style of management can undoubtedly be usefully interpreted and adopted by managers of any level. Frequently we do not trust our deputies and specialists, and we lose at least 3-fold because of this! First, we load ourselves with the work that they should be doing. And this takes us away from the work which only we can and should do. Second, the specialists and deputies develop a lack of confidence in the correctness of their own actions and a desire constantly to look for the opinion of the higher manager as well as a lack of ability for independent work. Consequently, in the third place, there is a narrowing of the group of managers capable of growing and taking on independent work.

The paragraph about bureaucratic distortion of management style in the first chapter is appropriate. The society is fighting against this evil with all available methods: in commentary, artistic literature, movies and so forth. But bureaucratism and forms of its manifestation, unfortunately, are persistent. They are like the flu virus, developing new kinds and forms of fighting against the measures that are applied against them. Every manager who wishes to achieve success in the work of the collective of which he is in charge should take a "hot iron" and burn out any signs of bureaucratism and eliminate them in the strictest possible ways from his subordinates. I sometimes limit myself to investigation and reprimand for mistakes in work associated with objective or subjective factors, but I always apply maximum disciplinary responsibility for bureaucratism and work, since I think it is the worst evil in any collective.

#### Requirements on the Personality of the Manager

This is one of the central (and from my point of view, most successful) chapters in the book. Relying on Lenin's work concerning the personnel policy and taking into account modern party positions, the author considers the role and position of the manager in production: his functions; problems of selecting a manager; the content of the requirements on the personality of the manager (political, business, moral-psychological qualities and socialist enterprising). A. M. Omarov asserts that as economic systems progress the content of the concept "business qualities" is modified. There was a time when the manager's ability to bring the collective out of difficult situations "at any price" was valued highly, but now a creative attitude toward work and workers is required of the manager. It seems to me that one cannot clearly divide the requirements for business qualities into "previously and now." Managers of the "hip-hooray" type and "think and analyze" existed previously and they exist now. But the situation in production, in science and in life has in general changed sharply in the direction of the manager of the type "think and analyze." In industry 20-25 years ago there was a predominance of managers who had gone through the difficult school of life of the war years and postwar construction. As a rule, because of objective factors not all of them managed to acquire solid VUZ knowledge. And their subordinates did not have a very level of theoretical training either. But these were people with the highest sense of duty and responsibility. For them the fulfillment of the plan was the highest law of life. I began to work as a lathe operator and a

foreman in machine building and instrument building under such managers. And in us youth they developed these qualities: responsibility, persistence, initiative. But time passed and production became more and more complicated, both technically and organizationally. It became more difficult to manage the collective. Specialists with a solid VUZ education who were politically literate came into industry.

I recall my work as secretary of the party committee at one of the large machine-building plants at the end of the 8th Five-Year Plan. We promoted to positions of top managers of the shops, divisions and the plant specialists who had obtained an education at the end of the 1950's and in the 1960's. But the process of enlisting for production management managers capable of analyzing production on a high professional level and extensively utilizing the potential of all workers of the collective is taking place even now. Only now the business qualities of the manager are determined also by the level of scientific training. I am confident that in the next 10-15 years the people who come to manage enterprises will have profound scientific knowledge and also organizational capabilities and a high degree of responsibility.

A very interesting part of the book is the analysis of the concept "Organizational Abilities." From many years of my own experience in managing a collective I have become convinced that the organizer must have the entire collective to assist him. In our plant we practice a system of discussing plans for the next year and the results of the past year with the participation of production commanders of all levels and also the entire collective. The directors and the head specialists discussed the results of the year at a conference of foremen, technologists and services for preparing production. Decisions from the conferences are analyzed annually and new tasks are set. Subsequently, with the participation of all managers and specialists of the plant meetings are held in the shops and divisions, where they also discuss the minutes of last year's meetings on the results. All this takes place for 1.5-2 months. We learn the opinions of our subordinates concerning the course of the fulfillment of the plans and their suggestions. The management of the plant not only teaches people to think about the interests of the plant, but demonstrate that it always needs the advice of the collective. This teaches the middle-level managers to consider the opinion of their subordinates and enlist in management activity workers who are knowledgeable, conscientious and filled with initiative.

A. M. Omarov correctly devotes a special place to the moral and psychological qualities of the manager: tact, honesty, honor and so forth. One cannot but agree with the author when he says that, quite unfortunately, in practice the moral and psychological qualities are clearly underestimated. Yet the experience of party and production work in various collectives suggests that moral and psychological qualities should be regarded as the main requirements for the personality of the manager. They largely determined the nature of the relations between the manager and his subordinate, the collective. A manager who is politically literate and businesslike but does not have a sense of tact or fairness cannot count on long-term, stable success in his work.

The final paragraph of this chapter is entitled "Socialist Enterprising." The theoretical foundation of this concept is not fully revealed and

substantiated in literature on personnel management. This gives one reason to think that the author is largely a pioneer in the theoretical substantiation of the concept.

I consider the author's conclusion correct when he says that enterprisingness in its truly socialist meaning is one of the most important features of the manager, which is necessary for searching out and realizing nonstandard decisions and increasing the effectiveness of management on the basis of the final national economic interest. One cannot consider socialist enterprisingness to be the manager's desire to isolate his enterprise from the interests of the country's national economy.

Under modern conditions with the improvement of the economic mechanism the problem of granting economic independence to managers of enterprises is especially crucial. The rigid frameworks envisioned by the numerous provisions and instructions are frequently directed toward artificial limitation of local initiative and do not make it possible to apply in practice the principles of socialist enterprisingness. The provision concerning the socialist production industrial enterprise envisions for the enterprise the right to write off from the books fixed capital that is no longer suitable for use, when it is impossible or economically inexpedient to restore it. The nonamortized value of the fixed capital was included in the losses of the enterprise with the exception of obsolete capital and that which is eliminated as a result of natural disasters and replaced in keeping with the planned introduction of new technical equipment. Subsequently this point was changed. Obsolete and unusable fixed capital, upon the expiration of the amortization period for their service, with the exception of that which has been eliminated as a result of emergencies and natural disasters, can be written off only with the permission of the higher organization, which creates certain difficulties in the work. As one can see from this example, the ministries are still on the path of a lack of confidence in the managers of enterprises. A. M. Omarev correctly asserts that any independence presupposes control. But, in my opinion, the argument that granting enterprises the right to dispose of wage funds and limits on labor influences the condition of the commodity satisfaction of the effective demand of the population is not very convincing. The limits of the wage fund for the enterprises will be established centrally and therefore there will be no problem with making a general summary of the wage fund for the various branches in the national economy as a whole. But the expenditure of the fund at the enterprises will be reasonable and directed toward paying for effective labor and not for the work position which is filled by a worker.

#### Manager and Subordinates

One frequently hears the opinion: 1) the manager is always right; 2) if the manager is not right, then read point 1. How does one arrange the interrelations between the manager and subordinate so that the wolves will be satisfied and the sheep will still be alive? This is a complicated question. But A. M. Omarev has presented the subject completely and with substantiation. I agree strongly with his conclusions and wish to discuss the moral and psychological basis of these interrelations. The author asserts that the greater the person's intellect, the greater the degree to which he discovers

himself as a force capable of strengthening or limiting the effectiveness of the activity of subordinates. The manager must understand and respect the psychology of subordinates. They cannot all be approached in the same way. The behavior of a subordinate and his reaction to the controlling influence are determined by moral and psychological peculiarities. It is necessary to anticipate how subordinates will react to managerial influence and understand their internal condition. A. M. Omarov sees in this the key to solving many problems of interrelations between manager and subordinate.

As an example that emphasizes how important it is to take into account the individual moral and psychological peculiarities of subordinates when achieving a goal, I wish to give a case from my own practice. When at the beginning of the 1970's I was appointed director of the plant I was faced with many problems. The plant had not fulfilled the plan for a long time. It was overwhelmed with debts. The material and technical supply service and the transportation shop were in critical condition. And intraplant and extraplant shipments were of decisive significance for the plant. The situation was no better in the shops that produced the main products that were dispatched. Many measures had been earmarked to improve the situation for the plant, mainly to join the collective together with a common goal. The party committee and the communists had done a great deal to implement the measures that had been developed with the participation of each shop chief and plant specialist. Everything that was earmarked had been adopted in heated debates. The measures had been considered by the technical council of the plant, approved by the party committee and then a summary order was originated which established strict time periods and responsible parties. Within literally a couple of days of the signing of the order the chief of the transportation shop came to see me without my calling him in and without a preliminary phone call. He asked permission to come in and on his way into the office without any ceremony he announced: "I will not fulfill the order concerning the restructuring of the shop. I do not agree with the measures concerning my shop and expressed this at the technical council and in the party committee."

You will understand the position of a director who has worked for only a year who is trying to restructure the operation of a plant, to whom the chief of a shop on which the further development of the plant largely depends, says that he will not follow an order. He has been working as a shop chief for a long time. He enjoys a great deal of authority in the plant. For the time being it is impossible to have a falling out with such a shop chief. But I understood that this was a kind of test of my firmness and confidence that I could finish what I had started. I had previously known this person and his firm, unbending character. As a rule he would not tolerate objections from his subordinates and he could give back whatever he received from his superiors as well. I was given seconds to make a decision. And I made a decision. Calmly but firmly I said: "Comrade P., stand up." Looking at me in confusion he slowly stood up. "If the order will not be fulfilled in your shop," I continued, "then you will be removed from this job and fired from the plant and I assume that the party and plant committees will back me up. Go now and remember that." He slowly left the office. During those days the chief of the shop for prepared products, M., came to me. He too had been working at the plant for a long time, was a member of the party committee, and was in charge of the people's control committee. By his nature he was a reliable,

sober-minded person, a good manager, who was able to handle everything that life dealt him. The person had authority. And M. did not come to me all of a sudden, he had called first. Naturally I appointed a time and received him. When coming up to my desk M. did not immediately begin the main conversation. Having reported on the situation in his shop and having mentioned the considerable difficulties with the fulfillment of the plan, in conclusion he said: "You know, I did not agree with the time periods for modernization and reconstruction of my shop. But you insisted both in the technical council and at the party committee on these rigid time periods which from my point of view are unrealistic. I would like to know what will happen to me if I do not manage to complete the reconstruction of the shop within these time periods?" It was the same question that P. had. What should I answer? It was impossible to apply the device of pressure as I did with P. M. was a different person and he needed a different approach. And I said to him: "If you fail to meet the time periods for reconstruction I shall go to the chairman of the people's control committee of the plant, a member of the party committee, M., so that he will consider the actions of the shopchief M. according to party principles. And he will give him an evaluation that he deserves. I think that the people's control committee and its chairman will take a correct position in the existing situation at the plant."

M. was silent for a long time. Then he stood up and said: "The director will not have to go to the people's control committee."

Of course I never told anybody about these two incidents and did not emphasize the extra control over these shops. I must say that both shop chiefs worked excellently. And the shops rapidly became leading subdivisions of the plant.

With this particular example I wish to emphasize that the methods of influencing subordinates should be varied. For one, it is necessary to go to the shop and department and give a "noisy" reprimand, while another, conversely, should be called "on the carpet." In your office.... Different people. Different approaches. Different measures of influence, both moral and material. But in any case the handling of subordinates should be fair. I have found it necessary at times to demote subordinates or recommend that they work at a different place. But this was fair to the subordinates. Of course it is difficult, troublesome and painful to convince a person that he is in the wrong place. But this is necessary not only for him but also for those around him. If people see that everyone is not threatened by an unfair attitude they gain confidence in the work. And this is one of the main conditions for success. It seems to me that the chapter of A. M. Omarov's book where he considers the moral and psychological foundations of interrelations, self-control and self-education of the manager and his word and deed generalize the main ideas in the book "The Manager."

While attentively reading A. M. Omarov's book I thought that, working in various jobs for so many years, I was looking for a book about the style of a manager where the material would be concentrated. All of us are undoubtedly guided by the works of V. I. Lenin concerning work with personnel. But not everything can be simply applied in practice. And it seems to me that we all use initiative in looking for the optimum in our relations with subordinates. And this work by A. M. Omarov provides an algorithm for finding this optimum.

We consulted with several chiefs of shops and departments of our plant and decided that in 1985-1986 in training the plant management personnel we would study the subject "Style of Management" and the program would be based on questions raised in the book "The Manager." The subjects for each class will be prepared by managers, relying on examples from plant practice. We shall invite the author of the book to the summary class in May-June 1986. This, in my opinion, will be a good school for our management personnel.

Of course, we cannot agree with everything the author says. But this is natural. In the work methods of a manager in the collective variation is quite possible. I should like for there to be more examples in the book. But nonetheless A. M. Omarov, from everything one can see, has rich experience in life and scientific production work, but examples would illustrate even more convincingly his ideas and conclusions concerning the style of the manager.

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